THE EFFECT OF CLASSROOM SEATING ARRANGEMENT ON THE SOCIAL COMPETENCY OF AUTISTIC PRESCHOOLERS

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ABSTRACT

This study investigated the effects of classroom seating arrangement on social competency for a sample of 12 autistic preschoolers at two daycare centers. Specifically, this study sought to determine whether pivotal social communication skills would significantly increase when autistic participants are seated at a table as compared to other designated spaces in the classroom. Subjective data was collected in this study through teacher assessments of the children using the Social Responsiveness Scale. Objective measures included naturalistic observations, which were conducted over the course of 6 weeks—3 weeks at each daycare.

Results of the objective data collection from all participants (N=12) revealed that social competency would be significantly increased when autistic children are seated at a table as compared to not at a table. Specifically, across all participants there was a significant difference in facial expression and affect ($p=.003$), non-verbal mannerisms ($p=.045$), voice volume ($p<.001$), and eye gaze ($p=.011$). There were no significant differences in the perseveration of topic scores between participants at the tables and not at the tables. The changes in appropriateness of behavior were significant at the 0.05 level. Subjective data found that participants, on average, fell on the mild to moderate range on the autism spectrum. Results also show that the variations in the data between participants were significant across all five sociocommunicative behaviors examined in this study.

The data also shows that the type of conversational partner and type of activity do not play a significant role in increasing social competency. The data further shows that there is no significant effect on interaction behaviors in classroom spaces other than at tables. However, there is a significant difference between table types in terms of which arrangement yields a higher frequency of appropriate behaviors. A significant difference

was seen in the level of appropriateness when participants were seated at the crescent, more semi-circular table.

BIOGRAPHICAL SKETCH

Vanessa Patricia del Aguila was born and raised in Washington, D.C. and graduated from Georgetown Visitation Preparatory School. In May 2008, she received her Bachelors of Science degree from Cornell University for the study of Human Factors and Ergonomics in the department of Design and Environmental Analysis. She continued her studies at Cornell University to complete her Masters degree concentrating in Applied Research in Human-Environment Relations.

Esta tesis está dedicada a mi familia – Mom, Daddy, and Melissa.

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Chapter 1: Introduction

Autism is a developmental disorder, which is most notably recognized by its defining characteristic: social impairment. One of the most important areas of concern for individuals with autism involves the daily challenges they face in terms of effective communication. Specifically, individuals with autism tend to have difficulties with social cues, which hinder their ability to make and keep friends. A recent study by Koegel and Frea (1993) has identified problem areas among certain autistic behaviors, which are pivotal to effective communication. These problematic behaviors include, among others, facial expression and affect unrelated to the conversation, non-verbal mannerisms unrelated to the conversational topic, perseveration on the same topic even after the conversational partner gives cues to change topics, voice levels (too high or low) that are incompatible with the setting, and fixed eye gaze turned away from the partner or relevant referent in conversation (ibid). As the number of children diagnosed with autism in the United States steadily increases every year, policy makers, school administrators, teachers and parents must continue to bear the rising costs associated with special programs aimed at addressing these problematic behaviors.

Today's autistic classrooms have specific curriculums designed to accommodate the diverse needs of each student. However, it is of profound importance to break free from more traditional therapies and treatments and explore innovative and cost-effective interventions aimed at improving problematic behaviors among autistic children. Research on the design standards within autistic classrooms has seen resurgence the past few decades and has been utilized as a springboard for this thesis. Most significantly, a substantial amount of the research discussed in this thesis has concluded that the use of tables in the classroom during conversation may be the most effective strategy for helping increase interaction rates and improve social communicative behaviors by maximizing visual eye contact. Eye contact, a social impairment among autistic

individuals, is important in every type of communication and also is very helpful in providing an understanding between two people. However, there is little to no research studying the effects of classroom tables during conversation on individuals with autism. For example, typically developing children who demonstrate high levels of social competency improve their physical health, academic performance, form larger social networks, and have a higher probability of employment as adults (Gilovich et al., 2005). Furthermore, non-competency puts children at a higher risk of having poor physical health and lower educational achievement (ibid). Finally, social isolation and weak social networks also subsequently increase the risk of conduct disorders, specifically aggression that predicts high-risk behaviors (Frey et al., 2000).

The present study evaluates the impact of seating arrangement on children diagnosed with autism spectrum disorders in two daycare centers in Ithaca, NY and Cortland, NY. Specifically, the experiment seeks to evaluate social interactions and the relationship between children when seated at table and when not.

1.1 Prevalence of Autism Spectrum Disorders

In 2007, the Centers for Disease Control and Prevention (CDC) released the findings of a study, which indicated that approximately 1 out of every 150 eight-year-old children in multiple communities of the United States has an autism spectrum disorder (ASD) (Department of Health and Human Services, 2008). This number has increased from the 1 out of 166 children reported by the CDC in 2004 (ibid). The study revealed that an average ASD prevalence was 6.7 children out of 1000 in the six areas that participated in 2000, while an average of 6.6 children out of 1,000 had ASD in 14 areas in 2002 (ibid). Examples of these areas include Arizona, Arkansas, Georgia, Maryland, New Jersey, South Carolina, and Wisconsin. All the children who participated in the studies were eight years of age, because previous research has demonstrated that this is the age that most parents of children with ASD seek treatment. Although it is unclear of how many individuals have ASD in the United States, the CDC estimates that for every 4 million children born in the United States each year, approximately 24,000 will be diagnosed with some form of the disorder (ibid). In addition, the risk of being diagnosed with ASD is three to four times higher with males than with females, and there are no known associations linking autism with race, culture, or socio economics (Berkell, 1992). Studies from previous decades have estimated that the prevalence of autism was only 4 to 5 out of 10,000 children (Department of Health and Human Services, 2008). However, the CDC's most recent study utilized the current criteria for diagnosing autism and autism spectrum disorders (ASD) and confirmed that, at present, rates are higher than those in previous studies (ibid).

Autism is now the sixth most common disability in the United States, trailing behind the prevalence of other childhood conditions, such as learning disabilities, mental retardation, emotional and behavioral disturbance, and other health impairments, such as Attention-Deficit Hyperactivity Disorder (ibid). According to data from the Individuals

with Disabilities Education Act in 2006, 224,594 individuals ages 6 to 21 and 35,111 individuals ages 3 to 5, all of whom were classified as having autism, received special education services (IDEA, 2006). These numbers do not represent the actual prevalence of ASD, because not all children who are diagnosed participate in these special educational programs (ibid).

The number of children classified as autistic who participate in special education programs increased significantly between 1994 and 2006 (Centers of Disease Control and Prevention, 2008). Specifically, the number of 6 to 17-year-old children with ASD in these special programs increased from 22,664 to 211,610 (ibid). It is evident that the number of children receiving public special education services for autism continues to rise. The costs for services involving education and the treatment of symptoms associated with ASD are growing as well. A recent study (Ganz, 2006) indicated that the annual costs associated with autism total to approximately 35 million dollars, in addition to the challenges the families have to face on a daily basis (Centers of Disease Control and Prevention, 2008).

These statistics illustrate the need for more research on therapies for autism spectrum disorders, especially cost-effective therapies. This is an especially important issue in educational settings as the number of children diagnosed with autism continues to rise. To better understand some of the debilitating factors associated with autism, the following section will examine autistic development.

1.2 Autism Spectrum Disorder

Autism is a complex developmental disorder whose most salient characteristics are defined by a triad of impairments: social reciprocity, communication, and repetitive behaviors or interests. Symptoms are presumed to be present at birth and are usually evident before the age of three (Lord, C. et al., 2000). According to the diagnostic criteria in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*, the features of autism specifically include (American Psychiatric Association, 1994):

1. Impairment in social interaction, as manifested by failure to develop peer relationships, lack of spontaneous sharing, lack of social or emotional reciprocity, and/or impairments in the use of multiple nonverbal behaviors
2. Impairment in communication, as manifested by delay in or lack of development of spoken language and gestures, impairment in the ability to initiate or sustain conversation, repetitive and idiosyncratic use of language and/or lack of pretend play
3. Restricted repetition of activities and interests, as manifested by the preoccupation of stereotypes and restricted patterns of interest, inflexible adherence to rituals, repetitive mannerisms, and/or persistent preoccupation with parts of objects.

There are some conditions that may easily be mistaken for autism but ultimately develop quite differently. Therefore, it is important to make distinctions between similar disorders because individuals will require "different therapy or care" and different diagnoses will have "different implications for education" (Trevarthen et al., 1998, p. 28). For example, almost all individuals with autism experience deficits in language, approximately 50% of whom never develop functional speech (Donaldson, 1995).

Individuals with autism require a different kind of help to improve interpersonal and social behaviors than those with specific language and communication disorders.

Autism Spectrum Disorder (ASD) is a term that describes a broader definition of autism, which includes the classical form of autism, as well as other developmental disabilities associated with the disorder that share similar deficits (Lord, C. et al., 2000). The four major disorders comprising the autism spectrum include: (1) *Asperger syndrome*; (2) *Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)*; (3) *Rett syndrome*; and (4) *Childhood Disintegrative Disorder*.

1.2.1 Asperger Syndrome

Asperger syndrome is characterized by impairments in social skills similar to those of individuals with autism. However, unlike individuals with autism, there are fewer language deficits of individuals with Asperger and they begin to talk before age two, the age when speech develops normally (Trevarthen et. al., 1998). Also, social abnormalities are still present (Baron-Cohen & Bolton, 1993). Asperger syndrome is more common than autism and comprises the majority of autism-spectrum diagnoses. High-functioning autism is a term that psychiatrists consider similar to or the same as Asperger syndrome (ibid). Individuals with high-functioning autism usually have average or above average intelligence (ibid). While there is no formal method of diagnosis other than counting the number of symptoms present during the early years of development, the differentiation between Asperger syndrome and high-functioning autism is minimal (Trevarthen et. al., 1998). Individuals with high-functioning autism or Asperger syndrome manifest more motivation to belong to a social network than individuals with other forms of autism.

1.2.2 Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)

Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS*)*, also known are *atypical autism*, first emerged as a diagnosis for individuals who have a milder form of autism with similar features but may not be as extensive (Lord et al., 2000). In other words, the term is used when full criteria for the other disorders are not met.

1.2.3 Rett Syndrome

Less frequent PDDs include Rett syndrome, which affects approximately 1 out of 15,000 girls (Rolando, 1985). Because the gene for Rett syndrome is located on the X chromosome, male fetuses rarely survive to term. The behavioral traits of an individual with Rett syndrome are associated with "pseudo-autistic abnormalities" (ibid). Early stages of Rett syndrome commonly resemble those of autism, resulting in its frequent misdiagnosis as autism (Trevarthen et. al., 1998). Around the age of nine months, an infant exhibits autistic characteristics, such as distracted attention, extreme quietness, weak posture, poor eye contact, poor coordination of limb movements, and the lack of interest in his or her immediate environment (Nomura et al., 1984; Trevarthen et. al., 1998). These features are considered the earliest symptoms of Rett syndrome. By 18 months, individuals with Rett syndrome show a high degree of retardation in their social and affective development (Olsson & Rett 1987). Like individuals with autism, those with Rett syndrome appear socially isolated, especially as they grow older. It is not until age two that the syndrome beings to progress through deteriorative stages, leaving the person with a severe mental handicap (Trevarthen et al., 1998).

A 1987 study compared the behavioral traits and mental development of children with Rett syndrome and children with autism, as well as children who exhibited autistic traits as a result of damage to the brain (Olsson & Rett 1987). The results of these observations established criteria for the diagnosis for Rett syndrome (ibid):

1. Female sex
2. Early behavioral, social and psychomotor regression, development of communication dysfunction and behavioral abnormalities similar to the symptoms of dementia
3. Loss of the ability to execute purposeful hand-skill, accompanied by stereotypic "hand-washing" movements, and the appearance of gait apraxia and tremors in the upper limbs or trunk between the ages of one and four years
4. Normal head circumference at birth, but later deceleration of head growth.

1.2.4 Childhood Disintegrative Disorder

Childhood Disintegrative Disorder (CDD) more commonly affects males than females and is estimated to affect 1.7 out of 100,000 children (Palomo et al., 2008). Children diagnosed with CDD undergo a period of typical development for the first two years of life (ibid). This period is followed by the extreme regression of several domains of development, including speech, social, cognitive, adaptive, motor, play, and self-help skills (ibid). Similar to CDD, the symptoms for autism may begin after a period of typical development; however, regression may occur earlier in autistic children, at around 18 to 20 months, and it is reported that many autistic children exhibit subtle signs of delay prior to the regression (ibid). After the period of regression and onset, CDD characteristics appear to be similar to those of autism. Ultimately, this "autistic-like syndrome" can be distinguished from autism in the pattern of onset, developmental course, and outcome (Volkmar & Rutter, 1995, p. 1092). At present, researchers know little about this rare disorder.

It is evident from the literature above that an autism spectrum disorder varies from individual to individual, especially with regard to ability and personality traits. The ASD spectrum has drastic extremes. At one end, individuals with autism can have severe mental retardation while others can have intellectually gifted abilities. Some individuals tend to withdrawal from social situations while others enjoy social interaction. In conclusion, manifestations of ASD vary for different individuals, with some experiencing milder symptoms than others.

While autism has been characterized as a primarily social-interactive disorder, cognitive system disorder, or a linguistic disorder, it is important to emphasize that there is no single system that influences autistic behaviors (Wilkinson, 1998).

1.3 Information Processing

Like a computer, the human brain is a system that processes information through the implementation of logical strategies and rules. Also, just as a computer, a child's sensory system can grow to become more sophisticated as he or she learns to use those strategies and rules. The brain of an autistic child has a different way of processing information.

Information processing is defined as "the act of receiving, interpreting, assimilating, organizing, controlling, storing, monitoring, retrieving, formulating, and expressing knowledge" (Twachtman-Cullen, 2000, p.226). The information-processing theory supports the claim that neurological functioning in autism involves multiple domains of higher-order processes, such as attention, sensory perception, motor, language, executive function, and visual-spatial domains (Minshew & Goldstein, 1998; Williams, et al., 2006). This theory originated from a neuropsychologic function profile study of 33 diagnosed autistic adolescents and adults and 33 individually matched normal controls (Minshew et al., 1997). This study investigated whether deficits in every aspect

of neuropsychology occur simultaneously rather than individually (ibid). The results provide evidence that these deficits do co-exist among multiple domains.

Williams, et al. (2006) tested this model in a study with children as participants, based on the previously mentioned Minshew et al. (1997) study of autistic adolescents and adults. The researchers investigated whether these deficits are present throughout the development of autism. When compared to adults, children with autism exhibited "more prominent sensory-perceptual symptoms and less pronounced reasoning deficits reflecting brain maturation" (Williams, et al. 2006, p. 279).

All the domains involved are intertwined within neural systems of the brain that regulate all physiological functions of a person (Twachtman-Cullen, 2000). Each domain can be described as having a "domino effect" by creating additional problems for other parts of the system (ibid).

1.4 Executive Function

While social interaction and communication abnormalities have proven to be the salient features of autism, there is substantial documentation supporting executive dysfunction in autism spectrum disorders. This theory of executive dysfunction stems from a link to frontal lobe damage (Russo et al., 2007). The observations in Damasio and Maurer's (1978) study, *A neurological model of childhood autism*, revealed that individuals with autism exhibit similar behaviors to those who showed impairments with higher-order processes of the brain, which are believed to be controlled in the frontal lobes. In a recent fMRI study of prefrontal cortex activity in 15 high-functioning participants with ASD, the ASD group exhibited "significantly greater signal-change in the prefrontal cortex during two executive function tasks when compared to the control group" (Gilbert et al., 2008, p. 2281). The disruption of executive functions in autism is

a result of the atypical brain activity as evidenced by increased activation during the tasks in the study.

For purposes of this particular research study, the way in which executive functions operate in autistic individuals is important because the specific processes involved affect daily interaction with the environment and overall communication. Executive function (EF) is a term that encompasses a wide range of functions, including planning, working memory, impulse control, inhibition, shifting set, as well as the initiation and monitoring of action (Hill, 2004). EF is important for the adoption of "complex roles in diverse areas of human functioning" (Twachtman-Cullen, 2000, p. 225). Thus, EF is not only important in problem-solving, but it also plays an integral part in socio-emotional behavior and overall adaptive functioning (ibid). EF dysfunction is common across the entire autism spectrum and also suggests that it may be the central deficit in autism (Ozonoff, 1998). EF impairments in the previously-mentioned functions are often manifested through the following behaviors: distractibility, impulsivity due to difficulty in delaying gratification and inhibiting inappropriate behaviors, perseverance and rigidity, repetitive and stereotypic actions, and difficulty with self-regulation (Twachtman-Cullen, 2000).

In summary, executive function allows human beings to process information from our environments. It is necessary in order for an individual to be able to think about a problem and implement an appropriate solution. As a result, autistic children who experience impairments in executive function will certainly have difficulty interacting appropriately and learning in the classroom.

1.5 Attention

Children with autism have the tendency to pay little attention to conversational partners during social interaction (Mesibov et al., 1997). Autistic children can be hypersensitive to certain attention-capturing visual stimuli, but insensitive to social and other stimuli that arise outside the narrow scope of their attention. In terms of autistic auditory response, these children may also ignore loud noises, which typically alarm normal developing children, while they dedicate their full attention to sound that are barely audible to others, such as the hum of a refrigerator (ibid).

A theory that describes this phenomenon is called "stimulus overselectivity" (Bailey, 1981). Stimulus overselectivity refers to situations in which an individual focuses attention on one stimulus in the environment, while simultaneously ignoring all others (ibid). Frith (1989a) proposed a theory hypothesizing that autistic individuals show tendencies toward "selective attention." Under this theory, individuals direct their attention to a certain stimulus when explicitly told to do so; however, when given choices, they have the tendency to turn their attention to more detailed aspects of the environment (Mesibov et al., 1997). These observations suggest that people with autism are not inattentive; rather, they attend to elements that they believe have more meaning than others (ibid).

With respect to selective attention theory, Courchesne and colleagues (1994) suggest that an autistic individual's selective attention results from a deficit of "shifting attention." According to this shifting attention theory, "people with autism have difficulty and are slower at disengaging attention from one stimulus to another" (Mesibov et al., 1997, p. 72). These assertions suggest that although individuals with autism seem to consistently restrict their attention, this restriction may be due to their inability to disengage from one stimulus to focus on another (ibid).

Joint attention is another early-developing social-communicative skill that is critical in the development of autism (Jones & Carr, 2004). It is defined as the shared

attention of two people to particular objects or events of interest through non-verbal behaviors of eye gaze alternation and conventional gesturing (ibid). Murray and his colleagues (2008), like most autism researchers, believe that joint attention typically develops between 9 and 12 months of age and becomes well-established by 18 months. There are two ways in which joint attention occurs: 1) when a child responds to the attention of another by following a gaze or a point, or 2) when a child initiates joint attention by directing the attention of another person to a visible target (Dawson et al., 2004). It is clear that gaze alternation and gesturing, such as pointing, serves as a means of social interaction when the child and adult or another child share attention toward a particular object of interest.

Children with autism exhibit significant impairment with joint attention. In the first epidemiological study of autism to attempt early diagnoses, Charman et al. (1997) discovered that children with autism produce fewer gaze switches of visual attention compared to normal and developmentally delayed children with respect to joint attention tasks. Researchers have reported that while autistic individuals' ability to use joint attention gestures to identify desired objects remains intact, their ability to engage other people in sharing their interest regarding that object is profoundly impaired (Baron-Cohen, S., 1989; Mundy et al., 1986; Murray, et al., 2008). These individuals specifically exhibit a "lack of spontaneous seeking to share enjoyment, interests, or achievements with others" (American Psychiatric Association, 1994, p. 70). Kasari et al. (1990) strengthens the link between joint attention and social disturbance by proposing that the development of joint attention may involve an affective component. Their research suggests that the types of attention acts that children have the most difficulty with involve the positive affect to others about objects or events (ibid).

1.6 Language Function

Most young children on the autism spectrum experience a delay in language development (Rapin & Dunn, 1997). Language skills vary greatly and range from mutism and little functional speech that tend to be idiosyncratic to advanced adult-like language capabilities (Frith & Happé, 1994). While humans commonly use words to exchange thoughts and intentions, non-verbal communication, such as the use of facial expressions, occurs as well (ibid). Table 1.1 summarizes key features of autistic language, as compiled by Rapin and Dunn (1997).

Table 1.1: Key Features of the Language of Young Children with Autism

Always impaired
Drive to communicate
Verbal and nonverbal pragmatics
Comprehension of gesturers, facial expression, tone of voice
Semantics
Formulation of discourse
Usually impaired
Prosody
Impaired or not
Phonology and syntax
Aberrant features
Immediate echolalia (pronoun reversal)
Delayed ecoholalia (scripts, formuliac speech)
Perseveration

Speech and language development in children includes expressive and receptive language. Expressive language refers to a child's ability to put words together and communicate messages. In addition, it consists of four integrated domains: pragmatics, semantics, phonology, and syntax (Wilkinson, 1998). It is possible for an individual with autism to be advanced in one domain and simultaneously delayed in another (Wilkinson, 1998; Cromer, 1988). Receptive language, on the other hand, refers to a child's ability to listen and comprehend what is being communicated to him or her. Impairments in

receptive language usually become apparent when the child finds answering questions and following directions difficult (Upton, 2009). Often, receptive language is much more developed than expressive language. The developmental delay of expressive language may be due to the motor impairments and executive function dysfunction in autism.

First, the most salient feature for language development in autism is pragmatics, which is the appropriate use of language in social situations. Non-verbal behaviors in this domain include eye gaze and gestures. Individuals with autism show impairment in speech-based conversations including turn taking, perseveration of topic, immediate and delayed repetition of words and phrases (a phenomenon known as echolalia), making irrelevant comments and sharing information with others (ibid). The fundamental aspect of pragmatics is the ability to comprehend a speaker's "communicative intentions" (Eilan, et al., 2005, p.167). An individual's ability to understand the meaning of speech and, consequently, understand how speakers use language in social contexts establishes the link between joint attention and the domain of pragmatics (ibid). Joint attention is essential in the development of pragmatics because it provides a basis for understanding and creating socially acceptable speech (ibid).

Second, semantics, also known as symbolic behavior, refers to the use of word meanings and concepts as communication (Rapin & Dunn, 1997). In addition to the display of unusual word patterns, research shows that language acquisition (e.g. vocabulary) may be compromised due to the abnormal development of semantic as well as joint attention (Charman, T., 2003; Dawson et al., 2004; Jones, E., 2004; Murray, et al., 2008). According to Baron-Cohen et al. (1997a), gaze monitoring, a component of joint attention, plays an important role in mapping word meanings. Typically developing children refer to the speaker's gaze at a certain object and make the connection between a novel word and a novel object (ibid). Baron-Cohen and his colleagues' study revealed that children with autism committed mapping errors because they lack sensitivity to a

speaker's gaze direction to infer their intended referent (ibid). In Baron-Cohen's study, 70.6% of developmentally challenged children correctly used eye gaze direction to determine the speaker's intended referent; however, only 29.4% of autistic children participating in the study correctly used eye gaze direction (ibid). The autistic children instead referred to the object they were observing at the time the novel word was introduced (ibid). Failure to understand these mental state concepts (Baron-Cohen et al., 1997b) is speculated to result from difficulties with joint attention. An infant's ability to touch or shake an object as a result of following another person's eye gaze is one of the simplest forms of communication. Language acquisition begins even without the use of words or speech. Consequently, the fault might not rest in semantics per se, but in the joint attention focus that is necessary for proper language development, specifically to help facilitate vocabulary growth.

Third, phonology is the domain that is specific to autism. It refers to the way in which speech sounds are organized and produced in language, specifically with pronunciation or articulation of sounds (Rapin & Dunn, 1997; Wilkinson, 1998). A subset of phonology is "prosody," which refers to patterns of speech, such as intonation, rhythm, and stress in the context of single words and recitals (ibid). For instance, deficits in the prosody of speech may manifest as unusually loud speech or singsong vocal sounds (Wilkinson, 1998). Specifically, voice volume has been reported to fluctuate between a whisper, mutter, or occasional loud exclamation (Fay & Schular, 1980). As other language domains begin to show improvement over time, prosodic skill remains impaired (Wilkinson, 1998).

Finally, syntax is defined as the grammatical rules, such as order, used in sentence formation (ibid). While syntactic skills remain relatively intact and do not appear delayed in individuals with autism, they are characterized by particular patterns rather than abnormalities (ibid). When comparing the expressive vocabulary and syntactic

structure of children with autism, there are no specific deficits in syntactic ability (Tager-Flusberg, 1994; Jarrold et al., 1997). However, a particularly salient feature of syntax is pronoun reversal ("you" and "me"), and echolalic speech (repetition of words or phrases) (Wilkinson, 1998).

Language is critical to understanding the wants, needs, and feelings of another person. With this in mind, research on the language, social and cognitive impairments of autism has led to the development of the "theory-of-mind" (ToM) hypothesis (Baron-Cohen et al., 1993). This observation demonstrates that individuals with autism have "profound difficulty interpreting a person's actions within a mentalistic framework" (Tager-Flusberg, 1996, p. 169). Miller (2006, p. 145) asserts, "theory-of-mind is necessary for communication through language, but language may in turn offer a way to learn about theory-of-mind". Accordingly, the development of ToM stems from one's ability to understand language through the act of listening to other individuals and engaging in conversations about their beliefs and emotions. During the first few years, a child is able to use joint attention to understand the meaning of the word "run", for example, by simply observing the actions of another individual. However, conveying mental states such as "to think" and "to believe" is best understood by hearing a verbal explanation. Moreover, language is critical for ToM development.

An autistic individual's inability to interpret the mental states of another is believed to be the reason why autistic individuals repeat information that is already known to the conversational partner and why they do not avoid making inappropriate and rude comments (Frith, 1989b). Autistic individuals find expressive gestures, such as a raised eyebrow, difficult to comprehend because it requires the realization of another person's state of mind (ibid). Much of the meaning of language is expressed through the way in which words are stressed (ibid). Normally, individuals emphasize words through either the rise or fall of voice. However, autistic individuals do not sense these cues due

to their inability to view the perspective of another (ibid). During conversation, typically developing individuals are able to anticipate what their conversational partner desires to hear at a specified time. Autistic individuals lack this ability and also often use idiosyncratic language that only has meaning to them and not to others (ibid).

Individuals with autism report that from the age when individuals start school and onward, the difficulties faced from these social language impairments give rise to anxiety, withdrawal from social situations, and issues with self-esteem (Landa, 2000).

1.7 Important Environmental Aspects of Classrooms for Autistic Children

In order to effectively address the diverse challenges students with ASD face daily in the classroom, teachers must focus on creating supportive classroom environments to maximize academic achievement and social integration. The following design standards are frequently implemented in many education facilities: (1) physical and visual boundaries, (2) minimal auditory and visual distractions, (3) sensory integration therapy, (4) predictability, and (5) flexibility. While each of these design standards makes positive contributions toward helping children with ASD thrive in classroom environments, they are not foolproof. Their individual benefits must be weighed against potential drawbacks. The following discussion examines the nature of each of the aforementioned design standards, how they influence behaviors in autistic children, and how they can be implemented in the classroom. Lastly, the discussion of classroom seating arrangement introduces a less common design standard, which shows promise in helping to increase social competency for children with autism.

1.7.1 Physical and Visual Boundaries

Physical layout is one of the most important aspects of classroom design for students with autism spectrum disorders. Here, physical layout specifically refers to the physical and visual boundaries that enable a student to better understand and add meaning to the environment (Mesibov et al, 1994). Dividing areas of the classroom into distinct segments helps clarify certain expectations of that space and functions as a prominent cue for appropriate behavior (Hume, 2007), as seen in Figure 1.1 below. Children with ASD are unable to automatically segment their environment in comparison to typically developing children (Pierangelo & Giuliani, 2008).

Figure 1.1 Segmented Areas of the Classroom

In order to decrease behaviors that trigger behavioral problems stemming from ASD, teachers must evaluate the degree of physical organization in the classroom. Such an evaluation depends on several factors. First, teachers should assess the physical

environment of the current classroom by taking into account the number of students, the amount of furniture, and the amount of space in between the furniture (Murdick and Petch-Hogan, 1996). Other factors to consider when manipulating classroom layout include the students' ages and the individual cognitive and physical needs of each student (Hume, 2007). For example, younger children, or children with severe impairments, may require a more structured environment than children with mild to moderate impairments (Gray & Shelley, 2007). In addition, teachers should consider the different types of spaces students require based on their individual needs. Such spaces, for example, vary and may consist of small group areas, larger group areas, work centers, and smaller spaces for more individual work or one-on-one instruction. Other classroom spaces may consist of areas that address motor development, sensory development, leisure skills, and imaginary play skills (Hume, 2007).

Physical boundaries show autistic children the areas of the classroom where specific activities are taking place (ibid). Segmented areas are also essential in helping students focus their attention on the more important aspects of an activity (Mesibov et al, 1994). Examples of common physical boundaries in classrooms include shelves, cabinets, and dividers for designated activity areas. A removable tabletop study carrel, for instance, can be used for both independent work and group work (Hume, 2007). Also, a bookshelf and chairs can provide space for a reading area (Mesibov et al, 1994).

Visual boundaries can further define different spaces and help students better understand what type of play and interaction is appropriate for a particular area of the classroom (Isbell, 2005). Visual cues—including, but not limited to, labels, rugs, floor tape or highlighting—may consist of color-coded placemats with a color assigned to each child, which indicate which activity is taking place at the table (Hume, 2007) (See Figure 1.2). Such cues are particularly useful for helping children with ASD keep objects and materials where they belong (Isbell, 2005). Significantly, studies have shown that the use

of visual cues is most frequently used with preschool students (ibid).

Figure 1.2 Colored Placemats for Various Activities (Hume, 2007)

Ultimately, physical and visual boundaries provide children with ASD with a more structured and organized classroom environment. According to Luiselli et. al (2008), a highly structured classroom helps to "facilitate, elicit, enhance, and support the acquisition of critical skills, including language, behavior, social interactions, and academics (p. 119-120)." In particular, classrooms with structured layouts enable children with ASD to (a) know what is currently happening in the learning process, (b) predict what will happen next, (c) anticipate the behavioral expectations of specific situations, and (d) learn and generalize various skills (ibid).

1.7.2 Minimal Visual and Auditory Distractions

Due to hypersensitivity in the sensory processing of autistic children, students with autism thrive in classrooms consisting of simple designs and few distractions. Thus, classrooms for children with ASD essentially contradict the saying that a learning environment be stimulating to all senses (McKnight-Taylor 1994; Dean, 1992). In general, "distracting" environments will likely increase sensory overload in autistic children and can subsequently result in high levels of anxiety and physical distress.

For example, in a study by Radosh and Gittelman (1981), researchers examined the effects of distraction on children, concluding that all levels of distraction affect children's abilities to perform tasks. In the study, twenty hyperactive and twenty typically-developing children performed tasks while experiencing three different levels of distraction: 1) no distraction, 2) low-appeal distraction, and 3) high-appeal distraction. Distractibility was defined as a compulsion to ignore relevant information when attention is captured by irrelevant information. The results revealed that the children were significantly more affected when they experienced both low- and high-appeal distracters compared to the typically developing children.

In terms of minimizing visual distractions, the use of basic color and finishes, such as off-white, may help reduce the level of complexity introduced by the environment that autistic children may otherwise have difficulty processing. Methods for reducing visual clutter in learning centers include the following: covering up unused materials with sheets and curtains from the view of the children, storing away unnecessary materials, and maintaining an organized space with adequate storage. Physical boundaries, such as screens and partitions, can also help eliminate visual distractions. Furthermore, natural lighting is critical for eliminating the distraction resulting from flickering fluorescent light bulbs (Pierangelo & Giuliani, 2008). Adjustable shades, for example, maximize control of light and help create a warmer and more serene learning environment. Finally, another effective technique consists of seating children away from uncontrollable classroom distractions by strategically placing the furniture and tables to face the classroom walls.

Sound can be equally as distracting to autistic children as visual stimuli, especially since autistic children have difficulty processing sound (Ceponiene et al., 2003 & Gervasi et al., 2004). In terms of minimizing auditory distractions, simple strategies include furnishing classrooms with acoustic tiling, as well as sound-absorbing carpets and

furnishings. Lowering auditory distractions in such ways can help children with autism distinguish relevant sounds from irrelevant sounds.

Ultimately, it is critical that classroom spaces should suit the needs of children who are both sensory-defensive and sensory-seeking. However, although helpful in moderation, the design standard of minimizing visual and auditory distractions should not be taken to the extreme. It is equally important for children to learn to function in an existing environment without having to eliminate all distracting elements (Schmidt & Heybryne, 2004).

1.7.3 Sensory Integration Therapy

Autistic children suffer from poor sensory information processing—a function necessary to make sense of one's surroundings (Ayers et al., 2005). Poor sensory information processing in autistic children, therefore, means that their brains do not effectively organize sensations (ibid). School, in particular, can be a stressful and overwhelming environment for autistic children with sensory integration problems. As a result, for example, autistic children may find forming and maintaining friendships especially challenging (ibid). In such cases, children may need help directing their attention to sensory information that will enable them to create a foundation for good relations with other individuals (ibid; Vogel, 2008).

A preschool classroom should foster an environment that "engages the senses… curiosity, and intellect through a variety of materials and activities" (Vogel, 2008, p. 3). Therapeutic techniques tailored for the classroom setting may improve an autistic child's ability to effectively process and react to information received from the body's primary senses—visual, tactile, auditory, olfactory, and oral (ibid). First, visual processing in sensory-defensive children can be improved through the use of laptop computers that do not flicker, papers with neutral colors that reduce high contrasts, and matte surfaces that

reduce glare. Sensory-seeking children, on the other hand, can benefit from mirrors and bright and colorful workstations. Second, techniques to improve auditory processing often involve the use of auditory products, such as music players, shakers, bells, and other musical instruments. Third, design solutions for improving tactile processing include the use of natural materials, such as textured wood instead of plastic. Water and sand tables may also be useful for enhancing tactile processing, in addition to auditory processing. Finally, foods such as crunchy nuts, and items such as scented markers and art materials, can stimulate the oral and olfactory senses. Caution must be used as materials, such as scented markers, have the potential to cause allergies and asthma.

In addition, although movement is not considered one of the five vital senses, autistic children can also benefit from classroom activities focused on improving balance and body awareness (ibid). For example, teachers can utilize trampolines, vibrating blankets, sensory gyms, and areas specifically designed for jumping, rolling and spinning in order to enhance motion control.

Although the aforementioned techniques can help improve sensory information processing, their intensive focus on stimulation inherently contradicts the design standard for minimizing distractions. Thus, it is important to recognize that each child possesses distinct sensory processing needs. For teachers, the challenge of designing a classroom space for children with autism is finding a balance between both non-distracting and stimulating elements.

1.7.4 Predictability

Predictability is an important design standard for individuals who depend on consistency and visual cueing in order to comprehend the spatial arrangement of a classroom. Predictability allows children to become more connected to an interior space and helps them attach meaning to certain objects and spaces (Evans & McCoy, 1998).

Accordingly, incorporating various design elements into the classroom environment can help increase legibility and recognition. Failure to incorporate clear cues that illustrate prescribed behaviors, conversely, increases the frequency of inappropriate behaviors (ibid).

To this end, Vogel (2008) recommends taking advantage of an autistic child's visual acuity. Creating clear pathways using colored tape, activity corners, bold and distinct edges, and prominent landmarks helps autistic children formulate mental maps of the overall plan of the space, essentially contributing to the sense of predictability in the classroom. Vogel (2008) also suggests that by offering environmental information through various sensory cues an autistic child will be able to comprehend the design of a space more effectively. However, an abundance of diverse stimuli has the potential to cause sensory overload in autistic children and should thus be avoided. The interior setting of a classroom should instead provide a moderate degree of visual cues in order to maintain the children's focus and attention.

Furthermore, the strategic use of routines, schedules and visual instruction enhance autistic children's abilities to understand different aspects of their environment and what is expected of them during classroom activities. First, the use of routines is an extremely important strategy for helping autistic children understand and predict the events around them (Mesibov et al., 2004). When teachers provide autistic children with routines, the children are less likely to develop their own stereotypical ways of approaching events, which are generally less acceptable in a classroom environment (ibid). For example, an autistic child may feel the need to bang his or her fork every time he or she sits down at the lunch table. It is extremely useful to redirect this tendency toward more productive routine activities. With time, their routines can be changed from "distracting liabilities to valuable assets" (Mesibov et al., 1994, p. 204) by learning appropriate safety (staying away from strangers) and leisure skills (playing a musical

instrument).

Second, schedules are yet another essential classroom element that tends to establish order and predictability. As with the physical structure of a classroom, schedules help explain which activities will occur during the day and in what sequence. Schedules enable children with autism to anticipate and predict activities and thus reduce anxiety that autistic children might otherwise experience from not knowing what to expect (ibid).

Isbell (2008) argues that using predictable sequences helps preschool children with autism understand how to utilize learning center spaces. Examples of predicable sequences are as follows (ibid):

1. Identifying the centers on a chart with pictures or a brief statement describing what is happening in each designated area.
2. Allowing children to make choices and indicate with their names or pictures where they will go that day.
3. Scheduling center time at the same time each day.
4. Using a consistent signal to prepare children for the end of center time and cleanup in the centers where they played.
5. Regrouping to talk about what children did in the center they chose.

Finally, visual instruction provides an effective means for autistic children to obtain clear information about expectations for classroom behavior. Visual instruction is particularly useful for autistic children suffering from problems with sequential memory and organization of time, language difficulties and oral instruction comprehension, and attention-deficit problems (ibid). The use of pictures, colors, numbers, and objects capitalize on their visual strengths and can be a helpful tool for learning how to follow directions and develop independence skills (ibid). For example, a *jig*—a silhouette or image that indicates exactly where an item should be placed—can provide additional

support (Gray & Shelley, 2007), as seen in Figure 1.3. Autistic children gain a sense of control from being able to predict particular events and activities, which can ultimately play a positive role in their social development.

Figure 1.3 Jig Use on Shelves (Stokes, 2008)

1.7.5 Flexibility

The predictability design standards mentioned above should incorporate some degree of flexibility. Given the dynamic nature of modern society, it is of paramount importance that children with autism learn to be flexible, decisive and adaptive to ever-changing stimuli in socially appropriate ways (Dalryple, 1995). Therefore, although teachers should continue to emphasize order and predictability in autistic classrooms, teachers must also strike a careful balance between respecting a child's attachment to routine and challenging him or her by subtly altering habitual classroom practices (ibid, Mesibov et al., 2004). For example, teachers may decide to incorporate slightly modified materials for work tasks, games, and during outdoor activities. Ultimately, while the fundamental structure of routine should remain predictable, the "details should vary so

that the individual can focus more on the overall structure rather than on the details" (ibid, p. 43).

1.7.6 Classroom Seating Arrangement

The literature reviewed in the previous sections reaffirms that a classroom's physical environment is the cornerstone for creating a constructive educational setting (Locke et al., 1995). Seating arrangement has long been recognized as a determinant of social interaction for children and adults, and, since the early 1950s when researchers first began to explore this area, our understanding of this design standard has gradually increased (Silverstein and Stang, 1976). Of particular interest to this experimental study are findings that correlate interaction patterns as a function of both seating position and the nature of group tasks.

Previous research has revealed significant correlations between classroom seating position and social interaction. Specifically, the results of a field study investigating the relationship between seating position and interaction rates in triads shows significant differences in the means between inter-subject interaction rates among young adults when they are seated at rectangular tables in a cafeteria (Silverstein & Stang, 1976). In this example, the person seated on the single side of the table had the tendency of talking more than either person seated on the other side of the table (ibid). These findings confirm the results of an earlier study (Ward, 1968), which concluded that subjects who face a higher number of subjects tend to have the highest interaction rates. Based on these results, it appears that seating children across the table from each other maximizes visual eye contact. Accordingly, Pellegrini and Empey (1970) suggest that people seated in close proximity tend to look away from each other, which further decreases interaction rates.

Mehrabian and Diamond's (1971a) study examined the effects of directness of

orientation on conversation among college students in terms of how many degrees one must turn to face another. The results indicated that 0-degree (face-to-face) and 90-degree orientations—positioned at right angles—are most direct, with the 90-degree arrangement being slightly less conducive to conversation. Meanwhile, the 180-degree (side-by-side) orientation proved to be clearly detrimental to maintaining conversation. Mehrabian (1969) further developed the concept of "immediacy," which describes how close a person is to another. He concluded that persons situated in more immediate positioning and at a more direct orientation would produce a higher degree of involvement in conversation. Another Mehrabian and Diamond (1971b) study investigating the effects of four types of seating arrangements—circular, rectangular, two-squares, or paired—also supports the assertion that more conversations take place between adults situated in more immediate positions. Interestingly, the results of this study also indicate that females generally converse more than males. This was expected since females tend to become more closely connected to a group than males and also prefer immediate positioning (ibid).

Furthermore, seating positions and orientations appear to dictate the outcome of certain classroom behaviors. For example, Rosenthal et. al. (1975) rearranged desks in fifth- and sixth-grade classrooms, finding that semi-circular seating arrangements were more conducive to social interaction among typically-developing children. In the study, students seated in circles engaged in significantly more on-task behaviors—including verbal and physical actions that contributed to discussion, such as discussion comments, speaking, and listening—than students seated in rows. Unfortunately, empirical studies on the effect of desk arrangements on classroom behaviors, such a Rosenthal's, failed to control for certain variables, such as the presence of attention deficit disorders, that could compromise the significance of the research findings.

More recently, Wheldall and Lam (1987) investigated the effect of row seating

arrangement versus clustered desks in three classrooms. They studied a special school for behaviorally troubled children with moderate learning difficulties, whose behaviors closely matched the behavioral characteristics of autistic children. The results showed that the rate of disruption among students was three times higher with the cluster desk arrangement than with the row seating arrangement. Yet another study (Patterson et al., 1979) found that the non-facing orientation (L-shape) produced more frequent self-manipulative behaviors than the facing orientation (circle)

The results of these studies mentioned above support the consistent findings of previous research, which conclude that less directly facing orientations would lessen interaction rates. Furthermore, when in small-group discussions, those seated across from one another lead to significantly more frequent appropriate behaviors.

As with seating position and orientation, it is important to examine the relationship between seating arrangement and group task. A study by Norum et al. (1967) investigated the interaction between the nature of group tasks and the seating arrangement preferred by group members. In one study, children either worked in one of three arrangements: individual effort, cooperative effort, or competitive effort (ibid). Subjects working individually and in coordination with others preferred side-by-side arrangements or corner locations. Moreover, subjects engaged in competitive tasks preferred to sit across from one another. Accordingly, Sommer (1965) observed college students in a cafeteria, where interaction is typically encouraged, and a library, where interaction is typically discouraged. He observed similar results with seating patterns under conversing, cooperating, co-acting, and competitive conditions. This is reasonable given that most students in the conversing and cooperating conditions choose adjacent seats to have more intimate conversations or share materials with one another. In addition, most students in the co-acting and competitive conditions prefer having two or more seats between them to minimize visual eye contact or to avoid seeing each other's

work. The results of these studies indicate that different tasks are associated with different seating arrangements.

Although research shows that classroom seating arrangement may positively impact interaction patterns and social communicative behaviors for typically developing individuals, there has not been a systematic study of the effects of seating arrangement on children with Autism Spectrum Disorders. Consequently, there continues to be a need to further explore this issue. The primary purpose of this study is to evaluate the effects of classroom seating arrangement on the social competency of children with autism. This study also sets out to investigate the relationship between seating arrangement, common classroom activities, and conversational partners.

1.8 Hypothesis

The following hypothesis has been formulated based on the empirical research reviewed.

Hypothesis:

1. Social competency, as measured by the physical data coding scale, will significantly increase when autistic preschool aged children are seated at a table as compared to being in other classroom spaces.

Chapter 2: Methods

2.1 Experimental Design

The design of this study was a quasi-experiment with participants serving as their own controls. The classrooms being studied were not manipulated or controlled by the investigator. The behaviors of the participants in each classroom were observed at various classroom furniture and spaces. Participants were preschoolers attending two daycare centers. Data collection occurred from May through June 2009. Social competency was operationalized by pivotal social communicative behaviors in an observation instrument. A survey of social competency, distributed to the classroom teachers, was conducted at the end of the observation period. This protocol was approved by the University Committee on Human Subjects.

2.2. Participants

Children diagnosed with an Autism Spectrum disorder attending daycare centers in Ithaca and Cortland, New York participated in this study. Twelve preschoolers participated, 6 children in each center. Identification numbers were assigned to each participant and used to compare the survey responses and the observational data. Demographic data were also collected including the participant's age, gender, where he or she fell on the spectrum, and any behavior characteristics that set the child apart from the other preschoolers (See Table 2.1).

All participants were observed in various spaces of the classroom, which included enclosed as well as open areas arranged for specific activities, and tables. Three participants in the study were frequently absent from the classroom during the interval of data collection due to private one-on-one meetings with the daycare teachers and other activities such as speech therapy. Additionally, parents of eight out of twelve consented to have the daycare teachers complete the survey.

Table 2.1: Subject Information

	Child	Gender	Age	ASD	Defining Characteristics
Ithaca	1	Male	56 mo	Mild	
	2	Male	61 mo	Moderate-Severe	
	3	Male	63 mo	Severe	
	4	Male	56 mo	Moderate	Motor
	5	Female	64 mo	Moderate-Severe	
	6	Female	62 mo	Mild	Mental Health
Cortland	7	Male	62 mo	Severe	
	8	Male	64 mo	Moderate	Motor
	9	Male	51 mo	Moderate	
	10	Male	56 mo	Mild	
	11	Male	54 mo	Severe	
	12	Female	51 mo	Moderate	

2.3 Classroom Environment

All participants in the study attended the Preschool Special Education program at the Franziska Racker Centers in either Ithaca or Cortland. The twelve participants shared the classroom with twelve typically developing preschoolers, six in each location. Classroom table arrangements included a rectangular table (Appendix A), a circular table (Appendix B), a trapezoidal table (Appendix C) and a crescent table (Appendix D). Other classroom spaces included a reading area (Appendix E); imaginary play area (Appendix F); circle-time area (Appendix G); manipulatives area (Appendix H); and art area (Appendix I). Other spaces include a free play area (Appendix J), which is activity in the open area in the center of the classroom and an "other" area (Appendix K), which is an area not designated for specific classroom activities.

2.4 Research Measures

2.4.1 Survey

To measure the social impairments associated with autism spectrum disorders, the daycare teachers in the study used Dr. John Constantino's Social Responsiveness Scale (SRS,2005). This newly established instrument is a brief (15-20 minute) assessment of children up to the age of 18. Rather than providing a "yes or no" answer about the presence of symptoms, the SRS measures impairment on a quantitative scale across a range of severity (for example, 1 = *not true*; 4 = *almost always true*) (Constantino, 2005). "Due to the wide range of severity among autistic individuals, it is best conceptualized as a spectrum condition rather than an all-or-nothing diagnosis" (ibid, p. 1). Sample questions included, "Seems much more fidgety in social situations", "Avoids eye contact or has unusual eye contact" and "Has difficulty relating to peers." The scale has been validated in published research involving over 10,000 children to date (ibid) (See Appendix L).

The use of quantitative tools for data collection was validated in a research study by Pine et al. (2006). They investigated the concordance between ratings of social impairment in autistic children by the SRS and other quantitative measurement tools (ibid). "There was substantial agreement between SRS scores and (1) the Vineland Adaptive Behavior Composite (Pearson's r = –0.86) and (2) scores for social impairment on the Autism Diagnostic Interview–Revised (r = 0.63)" (ibid, p. 345). This study concluded that autistic social impairments in preschool children can be qualitatively measured yielding reliable results (ibid).

2.4.2 Social Communicative Variables / Observations

Prior to the start of data collection present study, preliminary observations were conducted during times where interaction between children and teachers was more likely to occur. At each daycare center, the investigator spent two days during different times examining the social nature of the classrooms. Subsequently, the investigator concluded that conversation was more likely to occur during work and playtime.

After the researcher finished the pilot study, data collection officially began. For every 10-second interval within the conversation, each behavior was scored as either appropriate or inappropriate. The observation coding instrument was a slight modification of the instrument used in a previous study conducted by Koegel et. al. (1993). While it is impossible for this instrument to pinpoint every inappropriate or appropriate behavior, there is substantial research that indicates these pivotal behaviors are representative of the area of pragmatics (ibid). Appropriate facial expressions and affect were scored if the child displayed expressions that were relevant to the conversation, while inappropriate facial expressions and affect were scored if the child displayed expressions—often distorted—unrelated to the conversation for more than 3 seconds (ibid). These inappropriate behaviors also included inappropriate singing of verbal content, use of a cartoon voice, and impressions unrelated to the conversation, etc. (ibid). Appropriate non-verbal mannerisms were scored if the child displayed only gestures that were relevant to the topic of conversation, while inappropriate behaviors were scored if the child was observed to be persistently rubbing objects or moving his or her arms and legs for more than 5 seconds (ibid). Inappropriate behaviors also included particular gesturing that was overly exaggerated. Appropriate behaviors regarding perseveration of topic were scored if the child followed the topic of conversation throughout the duration of an observation session (ibid). Inappropriate behaviors, on the other hand, were scored if the child ignored the social cues that indicated that the topic had changed or if the verbalizations were related to the preceding topic when the partner

had clearly changed it (i.e. “Let’s talk about something else now”) (ibid, p. 371). Appropriate behaviors of the intensity of voice volume were scored if the child’s voice remained at the appropriate level for the setting and of the partner’s voice volume, while inappropriate behaviors were scored when there was a change from normal volume to either a yell or to a whisper for no reason whatsoever (ibid). Appropriate behaviors for eye gaze were scored if the gaze was in the direction of the partner or the relevant referent to the conversation (ibid). Inappropriate behaviors, however, were scored if the fixed gaze was directed away from the partner or relevant referent for more than 3 seconds (ibid).

Each behavior discussed above was scored for overall appropriateness by the primary investigator on a scale from 4 to 1, with 4 representing “very sure,” 3 representing “kind of sure” for inappropriate behaviors, 2 representing “kind of sure” and 1 representing “very sure” for appropriate behaviors. Figure 2.1 is an example of the scoring options:

Inappropriate behavior	Appropriate behavior
4 = very sure 3 = kind of sure	2 = very sure 1 = kind of sure

Figure 2.1: Scoring Options For Behaviors Observed

One advantage of having a scale with multiple levels, rather than having simply two options—appropriate or inappropriate—was to accurately measure the confidence of the rater. All physical observations were recorded on an observation coding instrument (See Appendix M).

2.5 Experimental Procedure

Data for the Ithaca daycare center was collected for three weeks. Observational data were recorded live continuously in 1-hour sessions of consecutive conversational interactions for three days out of five at different times of the day. Each child was observed for 5 minutes at a time in different spaces in the classroom. After three weeks of collecting data in Ithaca, another three weeks was spent observing at the Cortland location. Each teacher completed the Social Responsiveness Scale for each participating child after data collection had ended. The scale was completed at the end of the observation period to avoid influencing the teachers' behaviors towards the children.

To help control for instructional content, two daycare centers under the same umbrella organization were observed. As a result, the teaching philosophies and curriculums were similar across classrooms more so than if centers with different educational philosophies were studied.

The teachers completed a consent form—outlining the purpose of the study, the voluntary nature of participation, and the benefits and risks associated with being involved. Parents also completed a parental consent form that provided permission to distribute the Social Responsiveness Scale to the teachers. The SRS was administered with standardized instructions on the first occasion.

2.5.1 Interobserver Agreement

To establish reliability and to avoid subjective observation by the primary investigator, two observers independently scored previously taped footage of the interactions of typically developing children. The three observers' scores were compared for each of the five social behaviors. Many applied behavior analysts have used various measures of interobserver agreement; percentage agreement was found to be used more commonly. However, Lee & Suen (1983) reported that percentage agreement has "undesirable properties, including its inflation by chance agreements, and its use can be

expected to wane" (p. 375). In order to assess an unbiased reliability of the study, a kappa (k) value was calculated. The observers independently recorded each behavior as appropriate (2 or 1) or inappropriate (4 or 3). Agreement was defined as both observers coding an appropriate and inappropriate score within one number of each other. After scoring the behaviors of typically developing children, video footage of autistic children were scored to better distinguish the difference between behaviors. The primary investigator began collecting data after reaching an agreement of 100% (K=1) between both observers as well as between each of the observers and the experimenter.

2.6 Analysis

All data initially were coded into Microsoft Excel spreadsheets and subsequently imported into a multivariate statistical package (SPSS version 17) for analysis. Fisher's exact tests and two-tailed t-tests were used to test the significance of the differences between subjects seated at a table and when not. Univariate ANOVA tests were performed to see the effects of sitting at a table on all five social behaviors by examining the variation in the data between subjects. Univariate ANOVA tests were also conducted for all five social behaviors as a function of interaction type, activity type, table type, and other spaces used.

Chapter 3: Results

3.1 Participant Characteristics

In this study, the observational data were collected on 9 males and 3 females. The parents of only 8 children, 6 males and 2 females, provided consent for the teacher evaluation. The scores from the Social Responsiveness Scale are shown in Table 3.1 for the following social communicative behaviors: social awareness, social cognition, social communication, social motivation, and autistic mannerisms.

Table 3.1 Scores for Social Responsiveness Scale

		Participant Identification Number							
		1	**2**	**3**	**4**	**5**	**7**	**8**	**10**
Social Behavior Total Score	Awkwardness	48	57	77	65	57	77	74	63
	Cognition	50	64	81	69	81	64	76	64
	Communication	54	63	77	71	86	67	67	56
	Motivation	45	50	69	62	65	61	62	46
	Mannerisms	64	62	73	88	97	67	81	49
	Total	53	61	78	74	82	68	73	56

≥76T: Severe Autism 60T-75T: Mild to Moderate Autism ≤59T: Normal

3.2 Sample Seating Patterns

During the course of this experiment, observational data was collected by observing the 12 children either 1) sitting at a table or 2) engaging in an activity in a space where a particular classroom activity typically occurs. Each of which was coded as

sitting at a table and not sitting at a table, respectively. As seen in Table 3.2, children spent more than half of the observation time (59.4%) not seated at a table.

Table 3.2 Seated at Table vs. Not Seated a Table

	Frequency	Percent
Not at Table	778	59.2
At Table	536	40.8

Participants were most frequently observed in the "circle time" space (15.4%) and "other space" (14.0%), which included undesignated areas of the classroom such as the sink area and cubby area. The art area was observed to be the space where the participants spent the least amount of time (8%).

Table 3.3 Seated at Tables vs. Present in Other Classroom Spaces

		Frequency	Percent
Table		536	40.8
Space	Reading	69	5.3
	Imaginary Play	73	5.6
	Circle Time	202	**15.4**
	Manipulatives	140	10.7
	Art	8	0.6
	Free Play	90	6.8
	Other	196	**14.9**
	Total	1314	100

3.3 Sociocommunicative Behavior Comparisons

3.3.1 Facial Expressions and Affect

Chi-Square tests were conducted on observational data for facial expression and affect across all participants. The results show a statistically significant difference between participants who were not seated at a table and participants who were seated at a table ($\sum$=13.67, p=.003, by Fisher's Exact tests). The greatest amount of appropriate behavior for facial expression and affect occurred when children were seated at a table compared to when they were seated in other classroom spaces. The following results were analyzed using a two-tailed t-test. As seen in Table 3.4, the percentage for "very sure appropriate" behaviors rose significantly from not at the table (88%) to at a table (93%) (t=-3.01, p=.002). Additionally, the percentages for "kind of sure inappropriate" and "very sure inappropriate" behaviors decreased significantly from 5.4% to 3.2% (t=1.92, p=.056) and 3.9% to 1.1% (t=2.99, p=.003), respectively, when participants were seated at a table.

Table 3.4 Appropriateness of Facial Expression and Affect

	Not at Table		**At Table**	
Behavior Score	N	%	N	%
Kind of Sure Appropriate	21	2.7	14	2.6
Very Sure Appropriate	685	**88**	499	**93**
Kind of Sure Inappropriate	42	5.4	17	3.2
Very Sure Inappropriate	30	3.9	6	1.1

3.3.2 Non-verbal Mannerisms

Chi-Square tests were conducted on observational data for non-verbal mannerisms across all participants. The results show a statistically significant difference between participants who were not seated at a table and participants who were seated at a table ($\sum$=7.89, p=.045, by Fisher's Exact tests). The greatest amount of appropriate behavior for non-verbal mannerisms and gestures occurred when participants were seated at a table compared to other areas. The respective percentages of appropriate and inappropriate behaviors when seated at a table and when not seated at a table are listed in Table 3.5. The following results were analyzed using a two-tailed t-test. Specifically, the percentages for "very sure appropriate behaviors increased significantly from not at the table (88.3%) to at a table (92.9%) (t=-2.758, p=.006).

Table 3.5 Appropriateness of Non-verbal Mannerisms

	Not at Table		**At Table**	
Behavior Score	N	%	N	%
Kind of Sure Appropriate	26	3.3	13	2.4
Very Sure Appropriate	687	**88.3**	498	**92.9**
Kind of Sure Inappropriate	38	4.9	15	2.8
Very Sure Inappropriate	27	3.5	10	1.9

3.3.3 Perseveration of Topic

Chi-Square tests were conducted on observational data for perservation of topic across all participants. The percentages of appropriate and inappropriate behaviors for perseveration of topic when seated at a table and not at a table are shown in Table 3.6.

Table 3.6 Appropriateness of Perservation of Topic

	Not at Table		**At Table**	
Behavior Score	N	%	N	%
Kind of Sure Appropriate	5	0.6	12	2.2
Very Sure Appropriate	762	**97.9**	517	**96.5**
Kind of Sure Inappropriate	10	1.3	7	1.3
Very Sure Inappropriate	1	0.1	0	0

3.3.4 Intensity of Voice Volume

Chi-Square tests were conducted on observational data for voice volume across all participants. The results show a statistically significant difference between participants who were not seated at a table and participants who were seated at a table ($\sum$=28.59, p<.001, by Fisher's Exact tests). Table 3.7 shows the results for the social communicative behavior of voice volume. During the course of the study, the participants displayed low levels of inappropriate behavior during conversational interactions at a table. The following results were analyzed using a two-tailed t-test. The percentage for "very sure appropriate" behaviors rose considerably from not at the table (81%) to at a table (89.9%) (t=-4.033, p<.001). Additionally, the percentage for "very sure inappropriate" behaviors decreased from 9.0% to 2.6% (t=4.65, p<.001) when seated at a table.

Table 3.7 Appropriateness of Intensity of Voice Volume

	Not at Table		**At Table**	
Behavior Score	N	%	N	%
Kind of Sure Appropriate	27	3.5	22	4.1
Very Sure Appropriate	637	**81.9**	482	**89.9**
Kind of Sure Inappropriate	44	5.7	18	3.4
Very Sure Inappropriate	70	9.0	14	2.6

3.3.5 Eye Gaze

Chi-Square tests were conducted on observational data for eye gaze across all participants. The results show a statistically significant difference between participants who were not seated at a table and participants who were seated at a table ($\sum$=11.08, p=.011, by Fisher's Exact tests). Despite these results, the participants displayed highly variable levels of appropriate and inappropriate behaviors for eye gaze. The following result was analyzed using a two-tailed t-test. Table 3.8 shows the percentage for "kind of sure appropriate" behaviors increasing from 2.1% to 5.2% (t=-3.136, p=.002) when at a table, while the "very sure appropriate" behaviors decreased marginally.

Table 3.8 Appropriateness of Eye Gaze

	Not at Table		**At Table**	
Behavior Score	N	%	N	%
Kind of Sure Appropriate	16	2.1	28	5.2
Very Sure Appropriate	709	**91.1**	468	**87.3**
Kind of Sure Inappropriate	36	4.6	23	4.3
Very Sure Inappropriate	17	2.2	17	3.2

3.4 Type of Conversational Partner

Univariate ANOVA tests were conducted for all five social behaviors in this category. The data for facial expression and affect indicates that there was a significant difference among the various interaction types (F=2.89, p=.006). The mean for each interaction type (See Table 3.9) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for facial expression and affect indicate that the mean difference of the "one autistic child and one typically developing child" and "2 autistic children and 2 daycare teachers" interactions was statistically significant" ($\overline{X}$=-.638, p=.065). No other pairwise comparisons were significant. Therefore, facial expression and affect was rated as most appropriate during the pairing of one autistic preschooler and one daycare teacher (2.06 ± 0.02). The overall mean appropriateness of facial expression as a function of interaction type and mean standard errors are shown in Figure 3.1

Table 3.9 Mean and Standard Error of Facial Expression and Affect for Interaction Type

Type of Conversational Partner	Mean Appropriateness	Std. Error
No interaction	2.086	0.019
1 autistic & 1 TD	2.240	0.067
1 autistic & 1 autistic	1.976	0.101
1 autistic & 1 teacher	2.056	0.017
1 autistic, 1 TD & 1 teacher	2.011	0.086
1 autistic & 2 TD	2.403	0.239
2 autistic & 1 teacher	2.201	0.074
2 autistic & 2 teacher	1.557	0.212

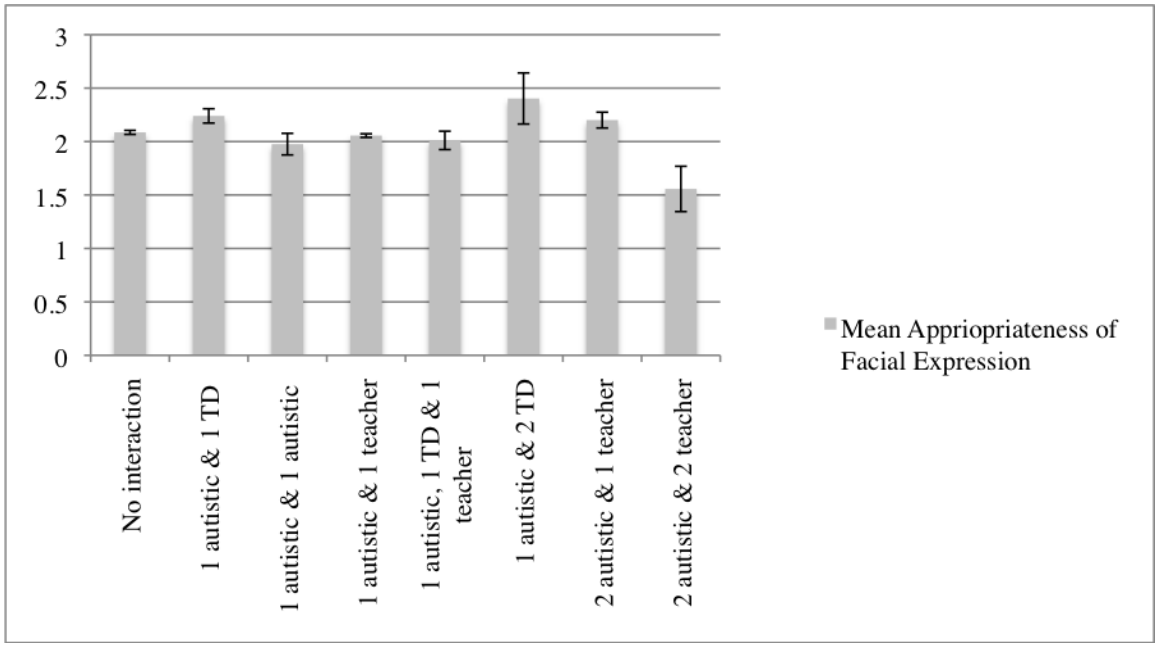

Figure 3.1: Mean for Facial Expression and Affect as a Function of Interaction Type (Mean ± S.E.)

The data for eye gaze indicates that there was a significant difference among the various interaction types (F=4.72, p<.001). The mean for each interaction type (See Table 3.10) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for eye gaze indicate that the mean difference between the "no interaction" and "one autistic child and one daycare teacher" interaction ($\overline{X}$=-.141, p<.001) was statistically significant. Therefore, eye gaze was rated as most appropriate when no interaction were taking place (1.99 ± 0.02). No other pairwise comparisons were significant. The overall mean appropriateness of eye gaze as a function of interaction type and mean standard errors are shown in Figure 3.2.

Table 3.10 Mean Appropriateness and Standard Error of Eye Gaze for Interaction Type

Type of Conversational Partner	**Mean Appropriateness**	**Std. Error**
No interaction	1.989	0.019
1 autistic & 1 TD	2.044	0.067
1 autistic & 1 autistic	2.018	0.102
1 autistic & 1 teacher	2.13	0.018
1 autistic, 1 TD & 1 teacher	1.934	0.087
1 autistic & 2 TD	1.711	0.242
2 autistic & 1 teacher	2.086	0.075
2 autistic & 2 teacher	1.965	0.214

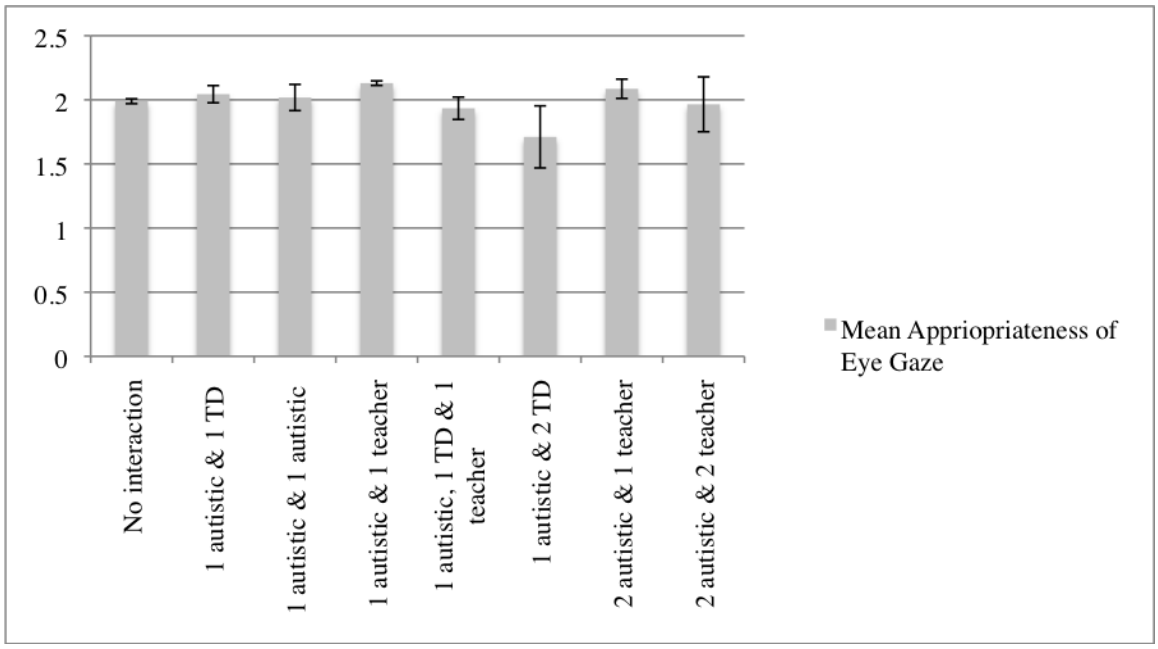

Figure 3.2: Mean for Eye Gaze as a Function of Interaction Type (Mean ± S.E.)

Furthermore, there was no statistical difference in terms of type of interaction on the appropriateness of non-verbal mannerisms, perseveration of topic, and voice volume when participants were seated a table compared to when they were not seated at a table.

3.5 Type of Activity

Univariate ANOVA tests were conducted for all five social behaviors in this category. The data for facial expression and affect indicates that there was a significant difference among the various activity types (F=2.65, p=.015). The mean for each activity type (See Table 3.11) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for facial expression and affect indicate that the mean difference between the "reading" and "other" activities was significant ($\overline{X}$=-.188, p=.052) . Therefore, facial expression and affect was rated most appropriate during the reading activity (1.95±0.06). No other pairwise comparisons were significant. The

overall mean appropriateness of facial expression as a function of activity type and mean standard errors are shown in Figure 3.3.

Table 3.11 Mean Appropriateness and Standard Error of Facial Expression and Affect for Activity Type

Type of Activity	**Mean Appropriateness**	**Std. Error**
Art	2.004	0.06
Work	2.078	0.037
Toys	2.048	0.02
Reading	1.948	0.058
Talking	2.093	0.056
Walking	2.096	0.037
Other	2.136	0.023

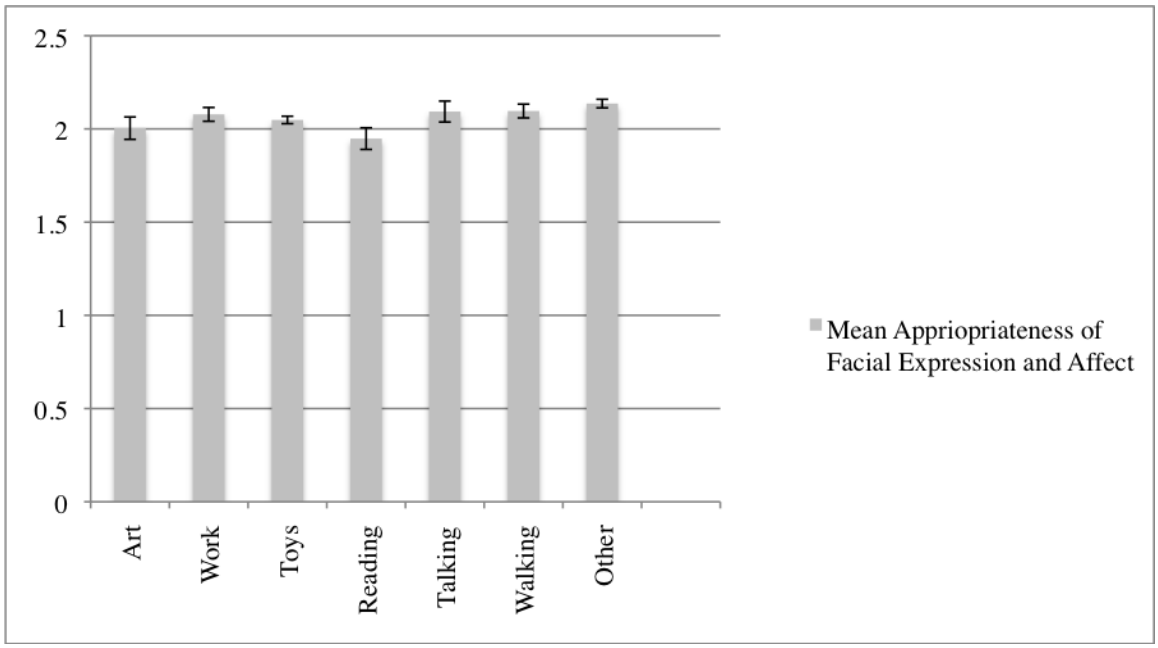

Figure 3.3: Mean for Facial Expression and Affect as a Function of Activity (Mean ± S.E.)

The data for eye gaze indicates that there was a significant difference among the various activity types (F=3.73, p=.001). The mean for each activity type (See Table 3.12) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for eye gaze indicate that the mean difference between the "work" and "toy" activities was significant ($\overline{X}$=-.151, p=.009). The mean difference between "work" and "talking" was also significant ($\overline{X}$=-.180, p=.030). Lastly, the mean difference between "toy and "other" activities was significant ($\overline{X}$=-.098, p=.022). Therefore, eye gaze was rated most appropriate during toy play (2.01 ± 0.02). No other pairwise comparisons were significant. The overall mean appropriateness of eye gaze as a function of activity and mean standard errors are shown in Figure 3.4.

Table 3.12 Mean Appropriateness and Standard Error of Eye Gaze for Activity Type

Type of Activity	**Mean Appropriateness**	**Std. Error**
Art	2.145	0.061
Work	2.159	0.037
Toys	2.008	0.02
Reading	2.049	0.059
Talking	2.053	0.057
Walking	1.979	0.038
Other	2.106	0.023

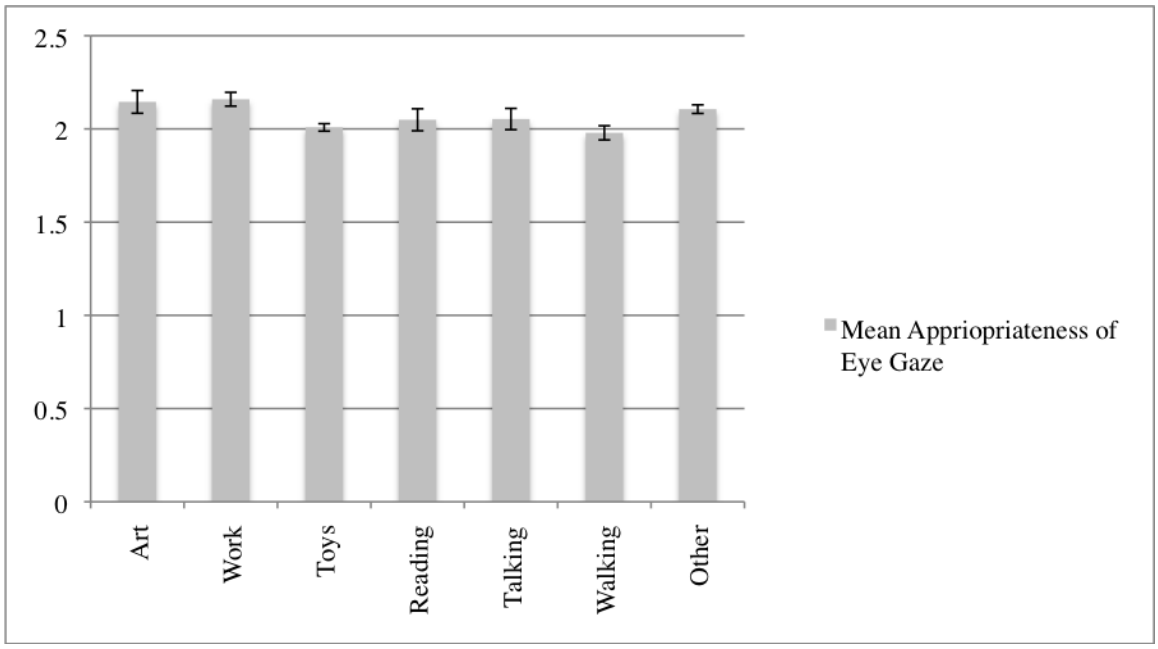

Figure 3.4: Mean for Eye Gaze as a Function of Activity Type (Mean ± S.E.)

Furthermore, there was no statistical difference in terms of type of activity on the appropriateness of non-verbal mannerisms, perseveration of topic, and voice volume when participants were seated a table compared to when they were not seated at a table.

3.6 Other Spaces

Univariate ANOVA tests were conducted for all five social behaviors in this category. The data for eye gaze indicates that there was a significant difference among the various other spaces ($F=4.80$, $p<.001$). The mean for each space type (See Table 3.13) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for eye gaze indicate that the mean difference between the "imaginary play area" and "circle time area" was significant ($\overline{X}=-.238$, $p<.001$). The mean difference between "circle time area" and "manipulatives area" was also significant ($\overline{X}=-.162$, $p=.008$). Lastly, the mean difference between "circle time area" and "other areas" was significant ($\overline{X}=-.156$, $p=.004$). These results indicate that there was more appropriate eye gaze in

the "imaginary play area" (1.94 ± 0.05). No other pairwise comparisons were significant. The overall mean appropriateness of eye gaze as a function of other spaces occupied and mean standard errors are shown in Figure 3.5.

Table 3.13 Mean and Standard Error of Eye Gaze for Other Spaces

Other Spaces	**Mean Appropriateness**	**Std. Error**
Reading area	2.063	0.046
Imaginary play area	1.940	0.048
Circle time area	2.178	0.03
Manipulatives	2.015	0.034
Art area	2.005	0.134
Free play area	2.029	0.042
Other	2.021	0.028

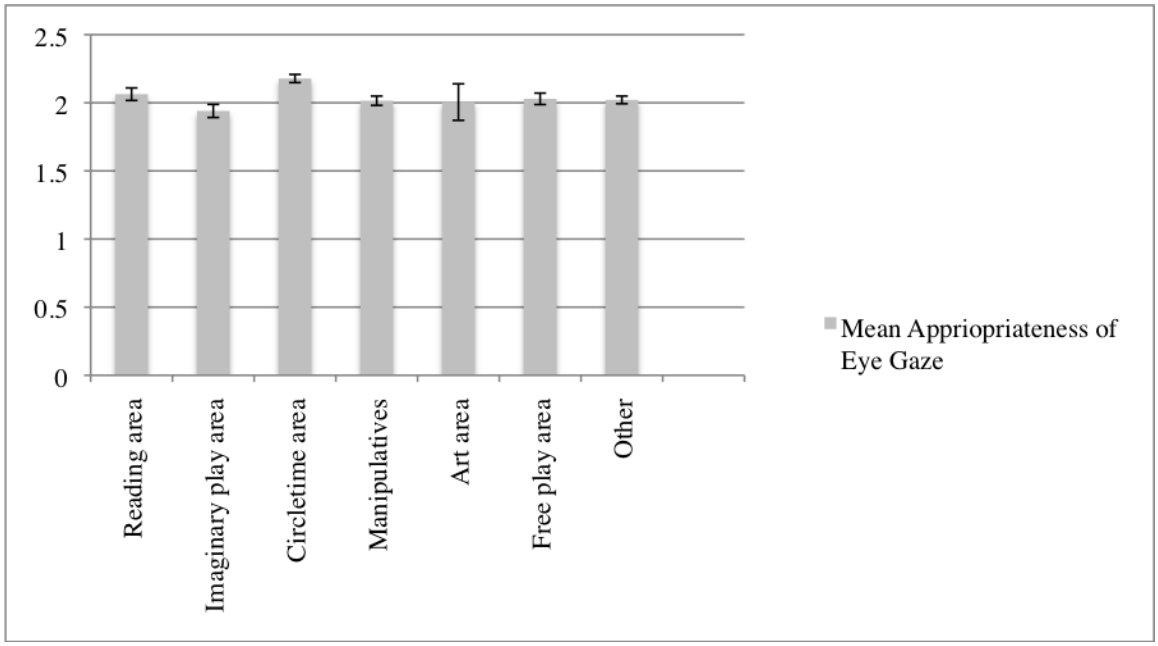

Figure 3.5: Eye Gaze as Function of Other Spaces (Mean ± S.E.)

There was no statistical difference in terms of type of other spaces on the appropriateness of facial expression and affect, non-verbal mannerisms, perseveration of topic, and voice volume.

3.7 Type of Table

Univariate ANOVA tests were conducted for all five social behaviors in this category. The data for perseveration of topic indicates that there was a significant difference among the various table types (F=4.90, p=.002). The mean for each table type (See Table 3.14) was tested using pairwise comparisons with Bonferroni-adjusted alpha levels of .05. Results for perseveration of topic indicate that the mean difference between the "rectangular table" and "circular table" was significant ($\overline{X}$=-.124, p<.002). The mean difference between "rectangular table" and "crescent table" was also significant ($\overline{X}$=-.083, p=.028). Therefore, perseveration of topic was rated more appropriate when the research participants were at the crescent tables (1.96 ± 0.02). No other pairwise comparisons were significant. The overall mean appropriateness of perseveration of topic as a function of table type occupied and mean standard errors are shown in Figure 3.6.

Table 3.14 Mean and Standard Error of Topic of Perseveration for Table Type.

Type of Table	**Mean Appropriateness**	**Std. Error**
Rectangular table	2.045	0.018
Circular table	1.921	0.027
Trapezoidal table	2.001	0.016
Crescent table	1.962	0.018

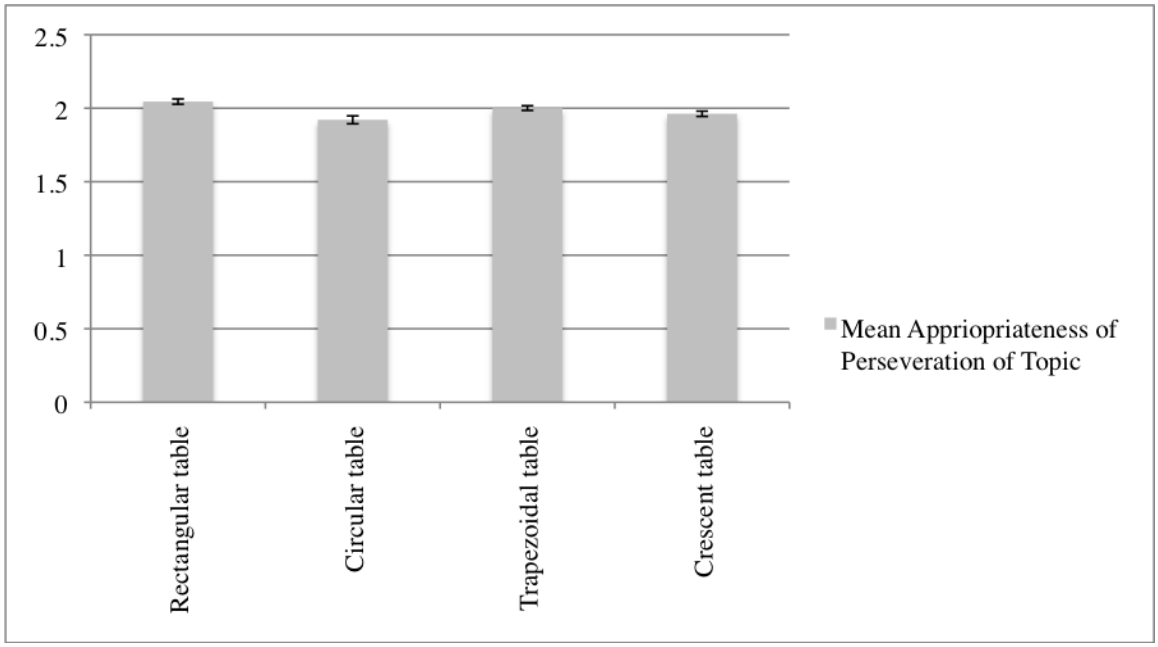

Figure 3.6: Mean for Perseveration of Topic as Function of Table Type (Mean ± S.E.)

The data for voice volume indicates that there was a significant difference among the various table types (F=3.54, p=.018). The mean for each table type (Table 3.15) was tested using pairwise comparisons with Bonferroni adjusted alpha levels of .05. Results for voice volume indicate that the mean difference between the "circular table" and "trapezoidal table" was significant ($\overline{X}$=-.203, p<.016). Therefore, voice volume was rated most appropriate when research participants were at the crescent table (1.98 ± 0.04). No other pairwise comparisons were significant. The overall mean appropriateness of voice volume as a function of table type occupied and mean standard errors are shown in Figure 3.7.

Table 3.15 Mean and Standard Error of Voice Volume for Table Type

Type of Table	**Mean Appropriateness**	**Std. Error**
Rectangular table	2.079	0.04
Circular table	1.907	0.058
Trapezoidal table	2.11	0.036
Crescent table	1.981	0.04

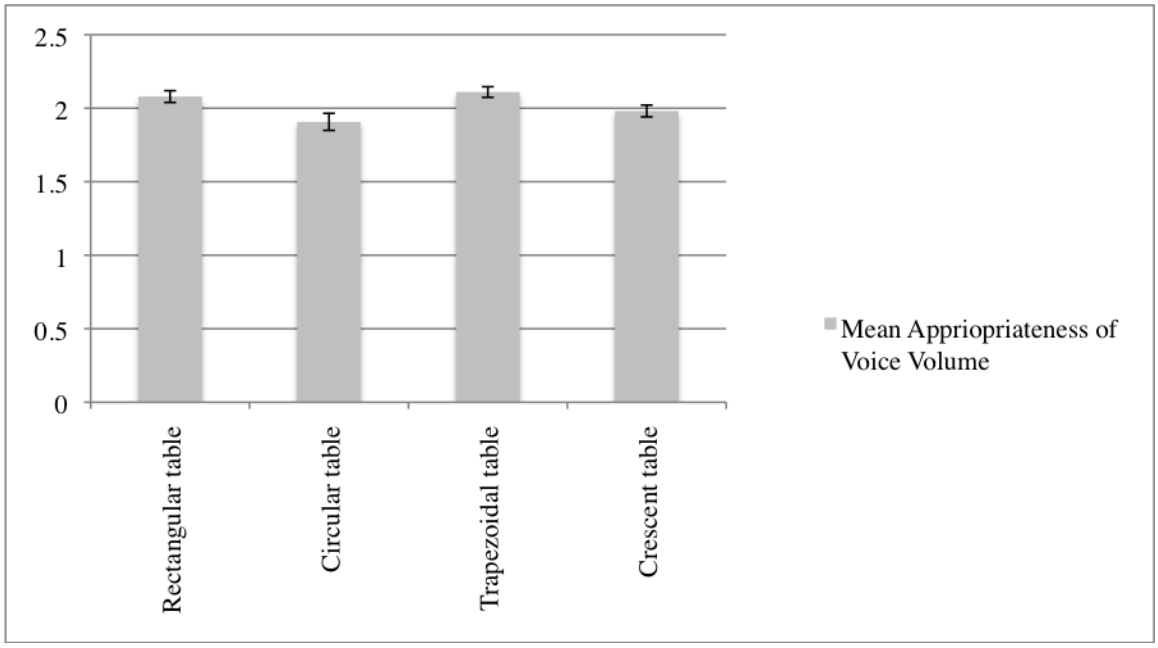

Figure 3.7: Mean for Voice Volume as Function of Table Type (Mean ± S.E.)

There was no statistical difference in terms of table type on the appropriateness of facial expression and affect, non-verbal mannerisms, and eye gaze.

3.8 Participant Comparisons

3.8.1 Facial Expressions and Affect

A univariate ANOVA test was performed to determine the effects of sitting at a table on facial expression and affect by examining variations among the children. There was a significant effect for "at table" ($F=7.70$, $p=.006$). The effect of participant is also statistically significant ($F=4.18$, $p<.001$), meaning that the means between children for facial expression and affect are significantly different. The significance levels for each parameter estimate, shown in Table 3.16, confirm that all of the children significantly differ from one another. Two children (ID #4 and 8) have been identified as outliers. Therefore, child #4 and child #8 exhibited less appropriate facial expression and affect when sitting at a table than the other children.

Table 3.16 Parameter Estimates for Facial Expression and Affect

ID					95% Confidence Interval	
	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
1	-.073	.063	-1.151	.250	-.197	.051
2	-.030	.062	-.495	.621	-.151	.090
3	.064	.061	1.060	.289	-.055	.184
4	.184	.070	2.618	.009	.046	.322
5	-.048	0.66	-.735	.463	-.177	.080
6	-.068	.066	-1.026	.305	-.199	.062
7	-.056	.058	-.965	.335	-.169	.058
8	.139	.058	2.397	.017	.025	.253
9	-.033	.058	-.559	.576	-.147	.082
10	-.036	.058	-.609	.542	-.150	.079
11	-.062	.060	-1.027	.305	-.180	.056
12	0	0	0	0	0	0

3.8.2 Non-verbal Mannerisms

A univariate ANOVA test was performed to determine the effects of sitting at a table on non-verbal mannerisms by examining variations in the data among children. The effect for "at table" on non-verbal mannerisms is marginally significant ($F=3.36$, $p=.067$). In addition, there is a significant effect of participant ($F=9.96$, $p<.001$), meaning that the means between children for non-verbal mannerisms are significantly different. The parameter estimates, shown in Table 3.17, confirm that the non-verbal mannerisms among participants are significantly different. Two children (ID #3 and 9) have been identified as outliers. Therefore, child #3 and child #9 exhibited less appropriate non-verbal mannerisms when sitting at a table than the other children.

Table 3.17 Parameter Estimates for Non-verbal Mannerisms

ID					95% Confidence Interval	
	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
1	-.098	.063	-1.564	.118	-.221	.025
2	-.007	.061	-.119	.905	-.126	.112
3	.297	.060	4.949	.000	-.179	.414
4	-.110	.069	-1.586	.113	-.246	.026
5	-.082	.065	-1.271	.204	-.209	.045
6	-.080	.066	-1.219	.223	-.209	.049
7	-.058	.057	-1.023	.306	-.170	.054
8	-.049	.057	-.859	.390	-.161	.063
9	.154	.058	2.676	.008	.041	.267
10	-.069	.058	-1.195	.232	-.182	.044
11	-.065	.060	-1.097	.273	-.182	.051
12	0	0	0	0	0	0

3.8.3 Perseveration of Topic

A univariate ANOVA test was performed to determine the effects of sitting at a table on perseveration of topic by examining variations in the data between participants. The results show that there is no significant effect on perservation of topic when seated at a table among these children ($F=2.51$, $p=.113$). Accordingly, it seems reasonable to infer that there is no difference in the appropriateness of perseveration of topic when seated at a table and when not seated at a table. However, a significant effect was found for participant ($p<.001$), meaning that the means between children for perseveration of topic are significantly different. The parameter estimates of perseveration of topic, shown in Table 3.18, confirm the variability in the means between participants for all table types.

Table 3.18 Parameter Estimates for Perseveration of Topic

ID					95% Confidence Interval	
	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
1	.048	.026	1.853	.064	-.003	.099
2	-.012	.025	-.492	.623	-.062	.037
3	.064	.025	-2.580	.010	-.113	-.015
4	-.005	.029	-.176	.860	-.062	.051
5	-.002	.027	-.076	.939	-.055	.051
6	-.027	.027	-1.002	.316	-.081	.026
7	.004	.024	.167	.867	-.043	.050
8	.016	.024	.668	.504	-.031	.062
9	.003	.024	.123	.902	-.044	.050
10	.005	.024	.229	.819	-.041	.052
11	.005	.025	.202	.840	-.043	.053
12	0	0	0	0	0	0

3.8.4 Voice Volume

A univariate ANOVA test was performed to determine the effects of sitting at a table on voice volume by examining variations in the data between participants. There is a significant effect of "at table" ($F=21.89$, $p<0.001$). In addition, there is a significant effect of participant ($F=10.51$, $p<0.001$), meaning that the means between children for voice volume are significantly different. The significance levels for each parameter estimate, shown in Table 3.19, confirm that all participants significantly differ from one another. Similar to the variable non-verbal mannerism, child #3 and #9 are identified as outliers. Therefore, child #3 and child #9 exhibited less appropriate voice volume when sitting at a table than the other children.

Table 3.19 Parameter Estimates for Voice Volume

ID					95% Confidence Interval	
	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
1	-.118	.083	-1.414	.158	-.281	.046
2	-.056	.081	-.689	.491	-.214	.103
3	.269	.080	3.381	.001	.113	.426
4	-.064	.092	-.700	.484	-.245	.116
5	-.071	.086	-.827	.409	-.239	.097
6	-.073	.087	-.840	.401	-.244	.098
7	.099	.076	1.299	.194	-.050	.247
8	.023	.076	.302	.763	-.126	.172
9	.398	.076	5.207	.000	2.48	.548
10	-.094	.076	-1.232	.218	-.244	.056
11	-.004	.079	-.051	.959	-.159	.151
12	0	0	0	0	0	0

3.8.5 Eye Gaze

A univariate ANOVA test was performed to determine the effects of sitting at a table on eye gaze by examining variations in the data between participants. The results show that there is no significant effect of being seated at a table (F=.136, p=.712). Accordingly, it is clear that there is no difference in the appropriateness of eye gaze when participants were seated at a table and when they were not seated at a table. However, there is a significant effect of participant (F=2.91, p=.001), meaning that the means between children for eye gaze are significantly different.

Table 3.20 Parameter Estimates for Eye Gaze

ID					95% Confidence Interval	
	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
1	-.139	.064	-2.160	.031	-.265	-.013
2	-.145	.063	-2.322	.020	-.268	.023
3	-.064	.062	-1.043	.297	-.185	.057
4	.025	.071	.344	.731	-.115	.165
5	-.092	.066	-1.382	.167	-.222	.039
6	-.129	.068	-1.913	.056	-.262	.003
7	-.029	.059	-.496	.620	-.144	.086
8	-.044	.059	-.748	.455	-.160	.072
9	.063	.059	1.062	.288	-.053	.179
10	-.116	.059	-1.965	.050	-.233	.000
11	-.008	.061	-.133	.895	-.128	.112
12	0	0	0	0	0	0

The parameter estimates for eye gaze, shown in Table 3.20, indicates that participant 2 is an outlier. Therefore, child #2 exhibited less appropriate eye gaze when sitting at a table than the other children.

Chapter 4: Discussion and Conclusions

4.1 General Findings

The present study has found that being seated at a table during conversation has a positive effect for the social communicative behaviors of autistic preschoolers. Results support the hypothesis that social competency would be significantly increased when autistic subjects are seated at a table as compared to other types of spaces in the classroom. In addition, the results further reveal that, in general, a higher frequency of appropriate behaviors occurs during interaction at the table.

This study extends the literature previously focused on improving social interactions through seating arrangement (Mehrabian & Diamond, 1975; Pellegrini & Empey 1975; Somer, 1965, Ward, 1968) by creating a new line of related research that examines the social integration of persons with autism. The results suggest that autistic preschoolers with impaired social skills tend to respond well to interactions occurring while seated at a table. The observational data collected for four social communicative behaviors—facial expression, non-verbal mannerisms, voice volume, and eye gaze (although highly variable)—shows a significantly greater frequency in appropriateness for participants seated at a table than for those not seated at a table.

Although it was hypothesized that there would be a significant effect in all five social communicative behaviors when autistic preschoolers were seated at a table, none was found for the behavior of "perseveration of topic"—when the child has followed the topic of conversation throughout the duration of an observation session without ignoring the social cues that indicated that the topic had changed. This outcome was not surprising given that many of the participants, including those who are considered to be "verbal," likely suffer from developmental delays related to expressive language. Ultimately, speech and verbalization between participants for this behavior category were

less frequent among autistic preschoolers during interaction and did not manifest significant differences when participants were seated at a table and when they were not.

4.2 Additional Findings

4.2.1 Sample Characteristics

The Social Responsiveness Scale reveals a moderate degree of variability between participants in terms of where he or she fell on the dynamic spectrum. The eight children with parental consent received scores ranging between normal, mild to moderate, and severe on the autism spectrum. First, two participants received scores in the normal range. It is rare but children with very mild, "high functioning" autism spectrum conditions may be rated toward the upper end of the normal range on the SRS (Constantino, 2005). Second, three participants received scores in the mild to moderate range. Scores in this range indicate impairments in reciprocal social behavior that are clinically significant and result in mild to moderate interference in everyday interactions (ibid). Finally, two participants received scores in the severe range. Scores in this range suggest that deficiencies in social behavior result in severe interference in everyday interactions and also provide compelling evidence that an autism spectrum condition is present (ibid). The average score result among this sample is in the mild to moderate range.

In terms of the observational data obtained from the children, Level 2—the score for "very sure appropriate" behaviors—occurred most frequently, rendering the counts in the other table cells to be very small. This can be liable to statistical noise. It is likely, and even probable, that this sample population of autistic preschoolers behaved in a tamer, calmer manner than many of their counterparts. This may have resulted, in part, from the specific curricula implemented by the participating Racker Centers. Classroom

inclusion may have also contributed to this occurrence as it is beneficial for individuals on the autism spectrum to interact with typically-developing peers who can model appropriate behaviors interaction. For example, a study by Baker et al. (1994), determined that "special-needs students [with learning disabilities] educated in regular classes do better academically and socially than comparable students in non-inclusive settings" (p. 34). The statistical tests examining the variations between subjects from the observational data, however, identified outliers in the data for each behavior. The outliers confirmed the broad range of severity, and the Social Responsiveness Scale accordingly expanded upon the range of deficiencies in social behaviors. More than half of the children observed (# 2, 3, 4, 8, and 9) generally experienced a difficulty expressing appropriate behaviors with at least one of the five social communicative behaviors.

It is inherently difficult to avoid variability among subjects with autistic spectrum disorders, especially in naturalistic experiments, because many classrooms cater to all types of children with all types of deficiencies. In this study, the few children with more severe deficiencies may have influenced the outcome of the data making it appear that the entire sample contributed to the results. This is also a problem for research in general. To this end, further studies should be conducted that examine more children with social behaviors that are at similar levels of the autism spectrum.

4.2.2 Type of Conversational Partner

This study also analyzed the relationship between seating arrangement and conversational partners. Of the five social communicative behaviors examined in this study, a majority (60%) did not reveal a significant difference between conversational partners when seated at a table. The three behaviors that did not show a significant difference in all situations include non-verbal mannerisms, perseveration of topic, and voice volume. Who an individual sits next to in any given setting can influence the

specific social behaviors of that individual. Individual differences contribute to seating choice primarily in terms of preference for proximity. Selecting one's own seat and, consequently, with whom to interact, results from the "affiliative" tendency towards a potential conversational partner (Mehrabian & Diamond, 1971). Here, the participants were observed in a natural setting, where they were given the opportunity to choose their own seats and, thus, with whom they would interact. In choosing their own conversational partners, several factors, such as the participants' attitudes and personalities, ultimately influenced the participants' social behaviors. Preference for proximity may also manifest in the participant's attraction to a particular activity another individual is engaged in. However, since the researcher did not interact with the participants, it is unclear where this motivation stems from.

The two behaviors that did show a significant difference include facial expression and affect and eye gaze. The results indicate that, on average, the conversational partner pairing that generated the highest frequency of appropriate facial expressions and affect in autistic preschoolers when seated at a table was the pairing of one autistic preschooler and one daycare teacher. One explanation for this occurrence is that most of the interactions between an autistic preschooler and a teacher were scheduled in advance to complete mandatory work. In these cases, the children did not have the opportunity to choose their own seats and, thus, his or her conversational partners. During work time, the teachers often provided small treats to the children in order to reinforce positive behavior. As a result, these treats may have the effect of conditioning behavior and may have influenced any other non-work related interactions with the teachers. In particular, this possible confounding variable may have increased the frequency of appropriate facial expression and affect behaviors.

The results also indicate that, on average, autistic preschoolers tend to exhibit a higher frequency of appropriate eye gazes when no interaction is taking place—in other

words, when the participant is by his or herself. Appropriate eye gazes in such a scenario include maintaining fixed eye gaze on the object of interest. This is not surprising given that there are few to no opportunities for "shared attention" or "shifting attention"—social communicative skills that are impaired in children with autism—to occur (Courchesne et al., 1994; Jones & Carr, 2004; Mesibov et al., 1997).

In summary, autistic preschoolers tend to exhibit higher frequencies of appropriate facial expression and affect when engaged in conversation with a daycare teacher. Additionally, autistic preschoolers tend to exhibit higher frequencies of appropriate eye gaze when interaction with no one. In conclusion, there is no definitive answer as to what type of conversational partner for an autistic preschooler significantly increases social competency when seated at a table.

For future research, it may be helpful to insure that participants not be acquainted with a conversational partner by ensuring that they have no opportunity to interact prior to the experiment. With these participants preparing to face the realities of the world outside the classroom, further research should investigate the relationship between seating arrangement and unfamiliar conversational partners.

4.2.3 Type of Activity

Previous research has shown that different activities and tasks are associated with different seating arrangements (Norum et al., 1967; Sommer 1965). For example, individuals in cooperating and conversing conditions benefit the most from adjacent or side-by-side seating arrangements. The present study analyzes the relationship between seating arrangement and common classroom activities and how this relationship affects autistic children's communication behaviors. Of the five social communicative behaviors examined in this study, a majority (60%) did not reveal a significant difference between classroom activities when seated at a table. The three behaviors that did not show a

significant difference include non-verbal mannerisms, perseveration of topic and voice volume.

The two behaviors that did show a significant difference included facial expression and affect and eye gaze. The results indicate that, on average, the activity that generated the highest frequency of appropriate facial expression and affect in autistic preschoolers when seated at a table was reading. The results also indicate that, on average, autistic preschoolers tend to exhibit a higher frequency of appropriate eye gazes during toy play. The results indicate that seating arrangement did influence social behavior during a specific activity. However, it is difficult to provide clear evidence for this conclusion since further analysis is required to compare type of activity and table type. For example, the rectangular tables can generate corner or side-by-side arrangements (rarely face-to-face in this study), either of which can influence social behaviors during specific activities. Researchers studying autistic behavior should further examine in detail how specific seating orientation and classroom activities influence these pivotal communication skills.

4.2.4 Other Spaces

This study also analyzes the relationship between interactions among autistic preschoolers while present in spaces of the classroom—reading area, imaginary play area, circle-time area, manipulatives area, art area—other than tables. Of the five social communicative behaviors examined in this study, 80% did not reveal a significant difference between interactions in other spaces, as opposed to interactions at tables. The four behaviors that did not show a significant difference include facial expression and affect, non-verbal mannerisms, perseveration of topic and voice volume. The only behavior that did show a significant difference was eye gaze with a higher frequency of appropriate behaviors exhibited in the imaginary play area. The imaginary play area

contains more neutral colors and non-distracting carpeting. It is possible that the lack of distracting elements in this space contributed to the higher frequency of eye gaze exhibited. In addition, the participants in this study may have felt that engaging in conversation in these spaces was less formal and less restricting when compared to sitting at a table, resulting in generally more inappropriate behaviors. However, this outcome seems to contradict existing research on how table arrangements maximize eye contact between individuals. Some individuals with autism will respond better and have improved eye contact and speech if the teacher interacts with them. Perhaps further analysis can determine the relationship between other spaces and social competency as a function of type of conversational partner. The results ultimately support the proposition that interactions occurring in other spaces, rather than at tables, do not significantly affect the majority of social behaviors that are pivotal for effective communication. The findings also generally show the rectangular and trapezoidal table to produce more frequent inappropriate behaviors. This outcome is consistent with previous research that arrangements with side-by-side and corner orientations are less conducive to maintaining conversation (Mehrabian & Diamond's, 1971a).

4.2.5 Type of Table

The effects of certain seating orientations and positions have been shown in some cases to drastically improve communicative and social behaviors in the classroom (Patterson et al., 1979; Rosenthal et. al., 1975; Wheldall & Lam, 1987). For example, circular and semi-circular arrangements have been the most conducive to social interaction among typically developing children, college students, and adults. These particular arrangements allow students to engage in more on-task behaviors. In contrast, research investigating the effects of row seating—best represented in side-by-side rectangular arrangements—shows higher disruption rates and self-injurious behaviors for

typically-developing children and adults (Patterson et al., 1979).

The present study analyzes the relationship between table type—rectangular, circular, trapezoidal, and crescent—and appropriateness of social communicative behaviors. Of the five behaviors examined, 60% did not reveal a significant difference in appropriateness of social behavior between table types. The three behaviors that did not show a significant difference include facial expression and affect, non-verbal mannerisms, and eye gaze. The two behaviors that did show a significant difference include perseveration of topic and affect and voice volume. The results indicate that, on average, the table type that generated the highest frequency of appropriate facial expression and affect in autistic preschoolers was the crescent table. The results also indicate that, on average, autistic preschoolers tend to exhibit a higher frequency of appropriate voice volume when seated at the crescent table. This conclusion provides support for the literature suggesting that students benefit from semi-circular seating arrangements. This most likely occurred because the arrangements naturally encourage social interaction and allow all non-verbal cues to be visible to everyone seated at the table. However, in this study, only one center used this semi-circular table.

4.3 Limits to Validity

4.3.1 Representative Sample

One limitation to this study was the sample size and subject variability. In the present study, only two daycare centers within the same umbrella organization were examined in this study, allowing for the possibility that other daycare centers would have different table configurations, classroom activities, and types of interaction. The limited sample size used in this study also influences the statistical power of the data. It was often observed that the participants utilized more table configurations than others,

resulting in abnormal distributions. Finally, manifestations of autism spectrum disorders in the present sample varied, with some children experiencing milder symptoms than others. Furthermore, the results may not be generalized to all children with autism.

4.3.2 Field Research

Another limitation to the validity in this study may have been the presence of the researcher. First, informing the daycare teachers of the research goals may have caused evaluation apprehension or self-consciousness. This could have occurred when the teachers both verbally and physically corrected inappropriate behaviors when they were observed interacting with the children. This could have resulting in a higher frequency of appropriate behaviors in the data. Additionally, children who approached the researcher during data collection could have influenced the scores of social behavior by making it difficult to code that type of interaction. Accordingly, future studies in this field of study should consider ways to ensure indirect, non-obtrusive measures that will not inadvertently interfere in the experiment.

4.3.3 Rater's Lack of Blindness to Hypothesis

Another limitation is the sole rater's lack of blindness to the hypothesis of the present study. While the inter-reliability among the sole rater and observers was sufficiently high to compensate for the lack of blindness, it was possible for the rater to code some behaviors to help in proving the hypothesis to be true. This certainly would influence the final results. Ideally, two researchers other than the primary investigator would independently score the behaviors during the observation period.

4.4 Future Research

Some suggestions for additional research have already been integrated throughout this chapter. These will be discussed below, as well as several suggestions, which have yet to be addressed. First, this study presents correlative data. A child might have fewer behavioral problems when seated at a table because being seated at the table helps the child stay focused on the task at hand. On the other hand, the child might have fewer behavioral problems when seated at a table because he or she jumps up from the table when beginning to engage in inappropriate behaviors. In hopes of generating more causal data, it would be helpful to conduct a study in which the classroom environment is manipulated by the researcher. A study introducing a test group to an intervention and a control group may be helpful in terms of finding the effects of classroom seating arrangement on social competency for children with autism. For example, after baseline data has been collected, children could be observed when seated at tables and when not seated at tables. Designing the experiment to have children either at a table or not during an equal amount of time would create more even distributions among types of interactions, activities, tables, and other spaces. Second, additional research should also focus on the precise positioning at each table configuration. To learn more about exact positioning rather than just being seated at a table may further enhance social competency in the classroom.

Third, further research that addresses different aspects of the sample population should also be explored. For example, additional research should include a larger sample size from more than two daycare centers. Large samples provide more reliable results, which can more truly reflect the population being investigated. Fourth, working with children who have milder autism may help to show greater significant differences among scores when compared to data from children who fall on various parts on the spectrum. Fifth, in addition to the Social Responsiveness Scale, researchers should also design a

comprehensive assessment for children about their social competency, which include interactions that occur outside of the classroom. Additional factors that would help in determining the effects of classroom seating arrangement should be further explored. These include physical health, frequency and duration of one-on-one private work sessions with the teachers, and social activities occurring outside of the classroom. Finally, future studies should consider ways to incorporate more indirect, unobtrusive observational measures, such as video recording.

4.4 Conclusion

The purpose of this study was to determine the effects of sitting at a table on the social competency of autistic preschoolers, specifically on the pivotal socio-communicative behaviors, which include facial expression and affect, non-verbal mannerisms, perseveration of topic, voice volume, and eye gaze. Currently, there is a lack of research on the effects of seating arrangement on autistic children and the benefits of certain seating arrangements in reducing inappropriate classroom behaviors. The significant differences in four of the five socio-communicative behaviors provide some evidence for improved classroom behaviors when participants are seated at a table compared to when they were not. The data also shows that the type of conversational partner and type of activity do not play a significant role in increasing social competency. The data further shows that there is no significant effect of interacting in classroom spaces other than at tables. However, there is a significant difference between table types in terms of which arrangement yields a higher frequency of appropriate behaviors. Specifically, the crescent table allows participants to engage in more effective conversations and interactions. Furthermore, the Social Responsiveness Scale results show that there is some degree of variability between participants in terms of autistic characteristics. However, the sample size was too small to test the difference between

children with mild autism and children with more severe autism and which benefitted more from semi-circular table arrangements.

The results of this study bring hope to many teachers arranging classrooms for autistic children as they seek easy and more cost-effective measures to increase social competency in preschool children with autism. Interaction occurring at a table, when attending preschool at a crucial time in development, had the tendency to decrease inappropriate classroom behaviors. With further research into matters mentioned in the discussion, there will be a greater understanding of autistic children's communication needs in the classroom.

APPENDIX A: Rectangular Table

APPENDIX B: Circular Table

APPENDIX C: Trapezoidal Table

APPENDIX D: Crescent Table

APPENDIX E: Typical Reading Area

APPENDIX F: Typical Imaginary Play Area

APPENDIX G: Typical Circle-time Area

APPENDIX H: Typical Manipulatives Area

APPENDIX I: Typical Art Area

APPENDIX J: Typical Free Play Area

APPENDIX K: Typical “Other” Area

APPENDIX L: Social Responsiveness Scale

SOCIAL RESPONSIVENESS SCALE AUTOSCORE™ FORM | John N. Constantino, M.D. | **TEACHER REPORT**

DIRECTIONS
For each question, circle the number that best describes the child's behavior *over the past 6 months.*

Student's Name: _____ Chronological Age: _____

Gender (required): ☐ Female ☐ Male Ethnicity: _____ Administration Date: _____

Respondent's Name: _____ Relationship to Student: ☐ Teacher ☐ Other _____

Grade: _____ School or Clinic: _____

PLEASE PRESS HARD WHEN MARKING YOUR RESPONSES.

1 = NOT TRUE 2 = SOMETIMES TRUE 3 = OFTEN TRUE 4 = ALMOST ALWAYS TRUE

1. Seems much more fidgety in social situations than when alone.	1	2	3	4
2. Expressions on his or her face don't match what he or she is saying.	1	2	3	4
3. Seems self-confident when interacting with others.	1	2	3	4
4. When under stress, he or she shows rigid or inflexible patterns of behavior that seem odd.	1	2	3	4
5. Doesn't recognize when others are trying to take advantage of him or her.	1	2	3	4
6. Would rather be alone than with others.	1	2	3	4
7. Is aware of what others are thinking or feeling.	1	2	3	4
8. Behaves in ways that seem strange or bizarre.	1	2	3	4
9. Clings to adults, seems too dependent on them.	1	2	3	4
10. Takes things too literally and doesn't get the real meaning of a conversation.	1	2	3	4
11. Has good self-confidence.	1	2	3	4
12. Is able to communicate his or her feelings to others.	1	2	3	4
13. Is awkward in turn-taking interactions with peers (e.g., doesn't seem to understand the give-and-take of conversations).	1	2	3	4
14. Is not well coordinated.	1	2	3	4
15. Is able to understand the meaning of other people's tone of voice and facial expressions.	1	2	3	4
16. Avoids eye contact or has unusual eye contact.	1	2	3	4
17. Recognizes when something is unfair.	1	2	3	4
18. Has difficulty making friends, even when trying his or her best.	1	2	3	4
19. Gets frustrated trying to get ideas across in conversations.	1	2	3	4
20. Shows unusual sensory interests (e.g., mouthing or spinning objects) or strange ways of playing with toys.	1	2	3	4
21. Is able to imitate others' actions.	1	2	3	4
22. Plays appropriately with children his or her age.	1	2	3	4
23. Does not join group activities unless told to do so.	1	2	3	4
24. Has more difficulty than other children with changes in his or her routine.	1	2	3	4
25. Doesn't seem to mind being out of step with or "not on the same wavelength" as others.	1	2	3	4
26. Offers comfort to others when they are sad.	1	2	3	4
27. Avoids starting social interactions with peers or adults.	1	2	3	4
28. Thinks or talks about the same thing over and over.	1	2	3	4
29. Is regarded by other children as odd or weird.	1	2	3	4
30. Becomes upset in a situation with lots of things going on.	1	2	3	4
31. Can't get his or her mind off something once he or she starts thinking about it.	1	2	3	4
32. Has good personal hygiene.	1	2	3	4

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PLEASE PRESS HARD WHEN MARKING YOUR RESPONSES.

1 = NOT TRUE	2 = SOMETIMES TRUE	3 = OFTEN TRUE	4 = ALMOST ALWAYS TRUE

33. Is socially awkward, even when he or she is trying to be polite.	1	2	3	4
34. Avoids people who want to be emotionally close to him or her.	1	2	3	4
35. Has trouble keeping up with the flow of a normal conversation.	1	2	3	4
36. Has difficulty relating to adults.	1	2	3	4
37. Has difficulty relating to peers.	1	2	3	4
38. Responds appropriately to mood changes in others (e.g., when a friend's or playmate's mood changes from happy to sad).	1	2	3	4
39. Has an unusually narrow range of interests.	1	2	3	4
40. Is imaginative, good at pretending (without losing touch with reality).	1	2	3	4
41. Wanders aimlessly from one activity to another.	1	2	3	4
42. Seems overly sensitive to sounds, textures, or smells.	1	2	3	4
43. Separates easily from caregivers.	1	2	3	4
44. Doesn't understand how events relate to one another (cause and effect) the way other children his or her age do.	1	2	3	4
45. Focuses his or her attention to where others are looking or listening.	1	2	3	4
46. Has overly serious facial expressions.	1	2	3	4
47. Is too silly or laughs inappropriately.	1	2	3	4
48. Has a sense of humor, understands jokes.	1	2	3	4
49. Does extremely well at a few tasks, but does not do as well at most other tasks.	1	2	3	4
50. Has repetitive, odd behaviors such as hand flapping or rocking.	1	2	3	4
51. Has difficulty answering questions directly and ends up talking around the subject.	1	2	3	4
52. Knows when he or she is talking too loud or making too much noise.	1	2	3	4
53. Talks to people with an unusual tone of voice (e.g., talks like a robot or like he or she is giving a lecture).	1	2	3	4
54. Seems to react to people as if they are objects.	1	2	3	4
55. Knows when he or she is too close to someone or is invading someone's space.	1	2	3	4
56. Walks in between two people who are talking.	1	2	3	4
57. Gets teased a lot.	1	2	3	4
58. Concentrates too much on parts of things rather than seeing the whole picture. For example, if asked to describe what happened in a story, he or she may talk only about the kind of clothes the characters were wearing.	1	2	3	4
59. Is overly suspicious.	1	2	3	4
60. Is emotionally distant, doesn't show his or her feelings.	1	2	3	4
61. Is inflexible, has a hard time changing his or her mind.	1	2	3	4
62. Gives unusual or illogical reasons for doing things.	1	2	3	4
63. Touches others in an unusual way (e.g., he or she may touch someone just to make contact and then walk away without saying anything).	1	2	3	4
64. Is too tense in social settings.	1	2	3	4
65. Stares or gazes off into space.	1	2	3	4

APPENDIX M: Observation Coding Instrument

ID	Time	Day	Week	X1	X2	X3	X4	X5	Table	Activity	Interaction	Other Spaces

Time
1 = 9:30am-10:30am
2 = 10:30am-11:30am

Day
1 = Monday
2 = Tuesday
3 = Thursday

Activities
1 = Art
2 = Work
3 = Toys
4 = Reading
5 = Talking
6 = Walking
7 = Other

Table
0 = No table
1 = Rectangular
2 = Circular
3 = Trapezoidal
4 = Crescent

Interaction
0 = No interaction
1 = 1 autistic, 1 TD
2 = 1 autistic, 2 TD
3 = 1 autistic, 1 autistic
4 = 1 autistic, 1 teacher
5 = 1 autistic, 1 TD, 1 teacher
6 = 1 autistic, 2 TD
7 = 2 autistic, 2 TD
8 = 2 autistic, 1 teacher
9 = 2 autistic, 2 teacher

Other Spaces
0 = Not Applicable
1 = Reading area
2 = Imaginary play area
3 = Circle-time area
4 = Manipulatives area
5 = Art area
6 = Free play area
7 = Other area

Sociocommunicative Behaviors
X1 = Facial Expression and Affect
X2 = Non-verbal Mannerisms
X3 = Perseveration of Topic
X4 = Voice Volume
X5 = Eye Gaze

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